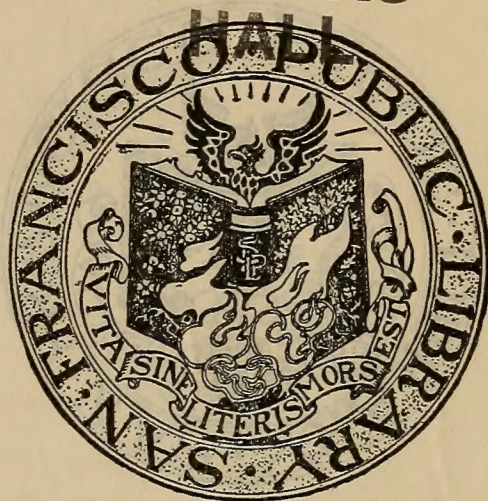






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# Index to Volume XLIV

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VOL. 44 NO. 1

SAN FRANCISCO, JANUARY 1, 1920

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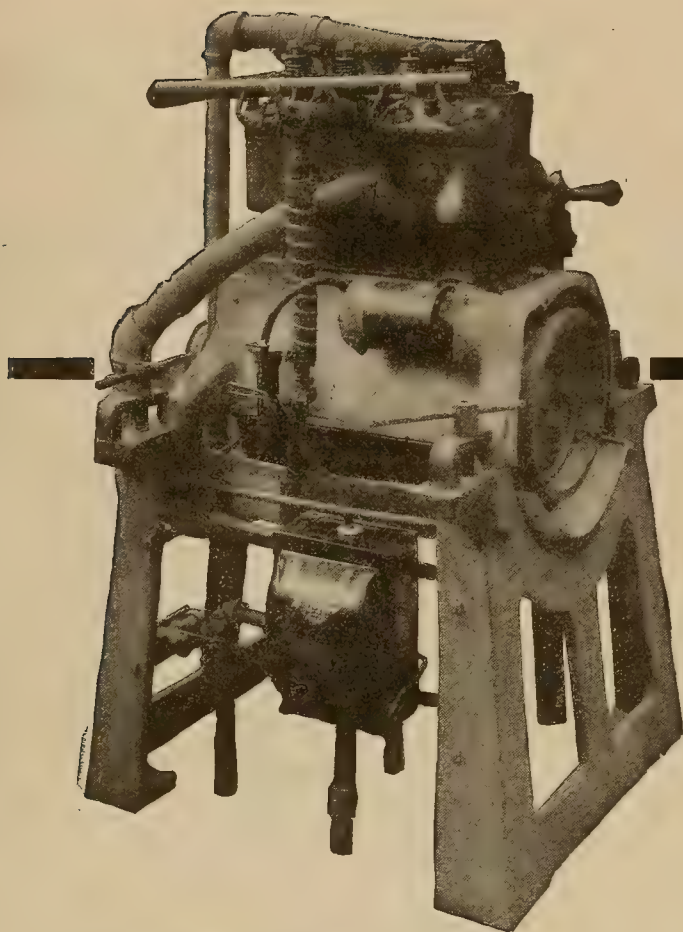


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# JOURNAL OF ELECTRICITY

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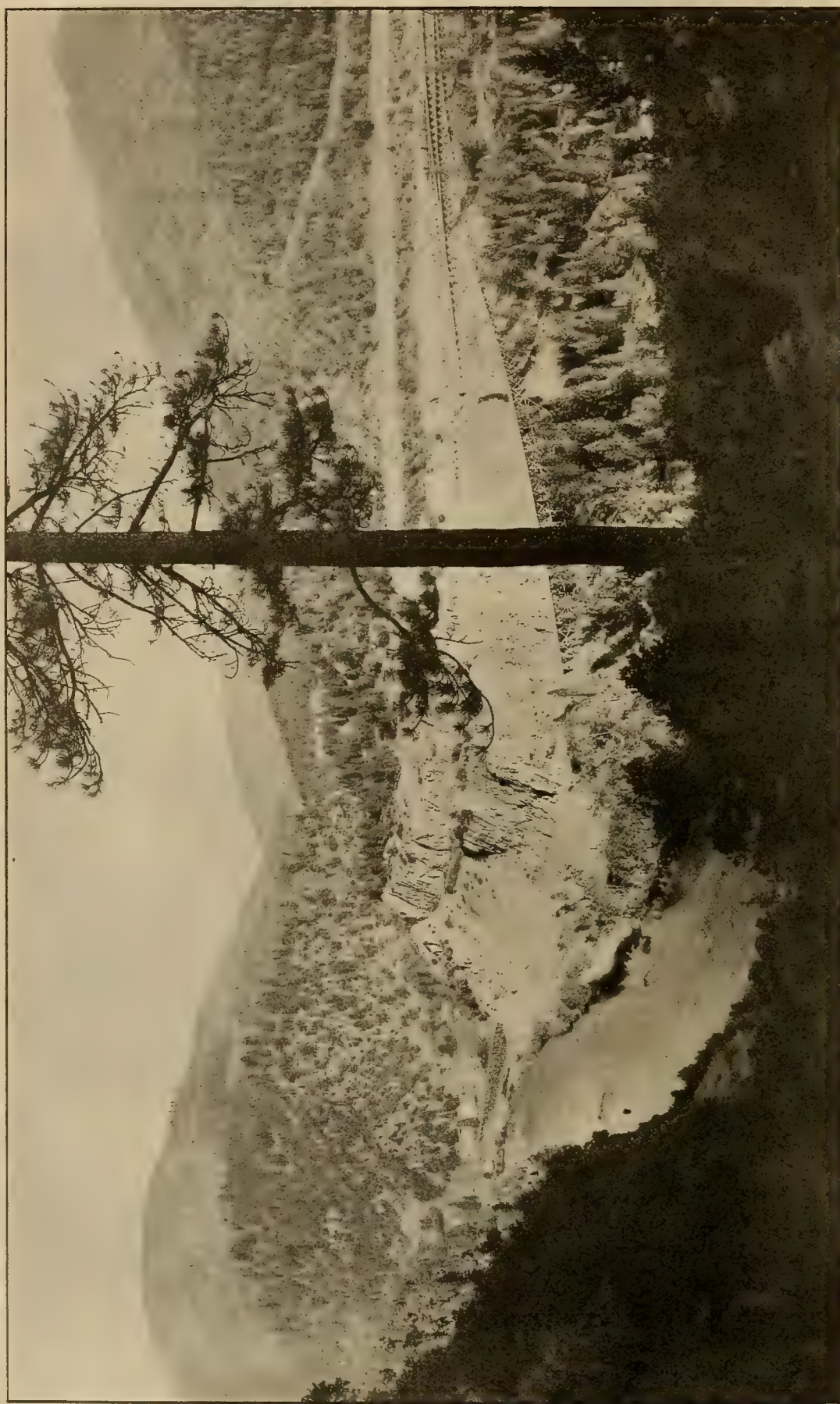
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**THE NEW YEAR** sees numerous construction projects under way in the West. The re-establishment of normal activities after the war period brought an insistent demand for power from the cities and agricultural districts alike, which has been met by the extensive plans for hydroelectric development now being carried out. Among the most important of these construction enterprises is the Caribou Project of the Great Western Power Company on the Feather River, California, where an additional 40,000 kw. will be added to the power already developed at the Las Plumas plant. The picture shows the switchback which connects the broad-gage road constructed by the power company with the Western Pacific Railroad, which here turns off to the East Fork of the Feather River.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, JANUARY 1, 1920

Number 1

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## The Dawn of a Decade

**T**ODAY, January 1st, 1920, the world waits expectantly upon the threshold of a new year, a new decade. It is a momentous epoch that we enter. Shaken to its very foundation by the strainings of terrible years of warfare, the civilization that has been humankind's heritage still survives, but must be upbuilt and strengthened anew. For all its transgressions, the world has not come to an end. Yet there is an end to much that we knew ten years ago; the world is a far different place to live in, strange new conditions surround us everywhere, insistent problems clamor for solution. Captains of industry are marshalling their forces on farm and in factory, proclaiming that this shall not be a decade of destruction and madness, but a period of production, ennobling labor.

We of the electrical industry must help preserve the fine sanity which is to safeguard the integrity of American industrial life within the next ten years. Material prosperity shall be ours by right of enterprise; but more than that, let us seek to aid the maintenance of health in the national mind.

The world spins dizzily through space; yet with this day's dawning has come the time for clear vision and steady hand. At the outset of these years which it is our hope posterity may hail as "the splendid thriving 'twenties," an appeal goes out from the council of nations, "The world must go to work!" We in the West are already at work.

That the Census of 1920 will reveal a remarkable growth for all Western states in population, wealth and material resources, is the confident expectation of those in touch with the development of this great section of the country

### What Will the Census Show?

within the past ten years. The compilation of the exact figures will be awaited eagerly, and, no doubt, despite all our estimates and guesses beforehand, they will contain many genuine surprises. It is essential that our true strength be shown in every field, and the efforts of all good citizens should be directed toward making this great decennial enumeration full and accurate.

Estimates as to the standing of the West in population and production have recently been made. The eleven states west of the Rockies hold 7% of this country's population—and it is interesting to note that of the electric power used in the United States, 20% is used in the West. Together with Alaska, the West produces 85% of our copper; 91% of our gold; 96% of our silver; 35% of our petroleum. The value of its fisheries is 45% of those of the whole United States. The worth of its farm property is 11% of the nation's; it produces 17% of the wheat; 25% of the orchard fruits; 47% of the nut crop. Of all the cattle in this country at the last census, 15% of them were in the West.

One notable field in which a gain will unquestionably be shown is manufacture. According to last reports the West produced 7% of this country's manufactures—exactly corresponding with its percentage of population. However, the development of hydroelectric energy and fuel oil, as well as new coal fields in Colorado and the Northwest, have given great impetus to industrial enterprise. The war, too, caused the creation of several large industries, notably shipbuilding.

Certainly in the manufacture of electrical machinery, apparatus and supplies, the West will show a gain. Hitherto California has been the only state in this territory that has had any considerable share in the industry. In 1909, there were 435 wage-earners engaged in making electrical machinery, apparatus and supplies in California; in 1914 there were 780. Today, there are possibly three times that number. One mazda lamp factory in Oakland employs almost as many workers now as all electrical factories in the state did five years ago. Colorado had about 100 persons engaged in this industry at the last census of manufactures, and that state also is expected to show a material gain.

There is much that the electrical industry in the West can do to help the enumerators in their task. Let us cooperate fully with the Bureau of Census, that the true strength of the states west of the Rockies may be truly represented before the world.



Construction has been begun on new hydroelectric power plants in California which will entail an expenditure of more than \$25,000,000, according to the recently issued annual report of the California State Railroad Commission.

### Confidence Well-Grounded

These plants will all be in operation in 1920 or 1921, and they will add enormously to the developed electric power in California. Yet the Commission, in commenting upon this, declares: "While an expenditure of \$25,000,000 may seem large, we are satisfied that it will not result in an over-production of hydroelectric energy." It is truly assuring to have such an authoritative statement from this commission, which is in an excellent position to judge what the industrial demands of the State are likely to be during the next few years.

The outstanding fact in this situation, however, is the confidence displayed by the power companies in entering upon a great program of expansion of hydroelectric systems, during a year which has seen scant rainfall and which follows two unusually dry seasons. That the power companies are going forward with their plans shows that they deem water resources not only adequate but ample; and, no doubt, the "pooling-of-power" plan under a centralized power administration, as carried out during the war and still retained, reassures them that they will be enabled to maintain a constant power supply at all times. There is confidence, too, on the part of investors, who make the proper financing of this development possible. They place dependence upon the proved integrity of the power company management and upon the attitude of a State regulatory commission which announces "a broad policy based on regard for the rights of the public, and fairness for the investor and the utility."

Surely, the hydroelectric development in the West is being undertaken in a healthy spirit of optimism—an optimism based upon facts, and a mutual confidence which is indeed gratifying to all who wish well to the electrical industry.

The new year means in most businesses a new set of books. With the taking of stock and the

### Beginning a New Set of Books

balance sheet which indicates totals for the year, a clean sweep is made of uncertainties and the new books are opened with a fresh slate. The opportunity which this offers for the adoption of the standard accounting system worked out by the National Association of Electrical Contractors and Dealers should not be overlooked. The system is the simplest and at the same time the most comprehensive which could be devised. It makes it possible for the contractor-dealer to know at any time just where he stands, either in his store sales and profits or in his contracting jobs.

The chief difficulty which has stood in the way of its universal adoption has been the necessity of closing the present books before a new set could be opened and the consequent labor involved. The new year brings this task as part of the regular run of business. Why not send for one of the Standard

Accounting Systems at once, in order to start the new year on a firmer business basis? The Journal of Electricity will be glad to receive orders for this set and to pass them on to the National Association—or orders may be placed with the secretary of your local association—or through such organizations as the California Electrical Cooperative Campaign. A special price at cost is made to members of the association, but the system may be purchased by anyone who desires to better his accounting methods.

The present age is one greatly addicted to phrases. According as a label is affixed to a movement or an individual, so is he judged, irrespective of the merits of the individual case. The injustices involved in the careless use of the term "trust," for instance, are familiar to the past decade, while the epithet "bolshevik" is perhaps the best example of a blanket condemnation at the present time.

### Dangers of the Word "Profiteer"

The word "profiteer" is one of the phrases of the moment, used promiscuously, sometimes with great injustice. It is a term which injures all business, through its implication of prevalent dishonesty. The privately owned utility has already suffered greatly through the popular tendency to rail against corporations and "big business." It is to the interest of every electrical man to discourage the careless use of epithets and the formation of another unfounded prejudice against business as a whole, which will later have to be wiped out through a campaign of education.

Widespread interest in modern industrial lighting is today being manifested throughout the manufacturing districts of the West, and the several elements of the electrical industry find themselves now constantly in receipt of inquiries on this important subject from plant owners, superintendents and others connected with factory management. Of particular importance, therefore, is the issuance of new General Lighting Safety Orders by the Industrial Accident Commission of the State of California. A comprehensive review of this up-to-date code is contained in the present issue of the Journal of Electricity.

### Industrial Lighting

The result of the new industrial lighting laws is certain to be a quite general readjustment of illumination arrangements in factories. There will undoubtedly be numerous requests by industrial interests for advice as to lighting changes. In this regard, a careful survey recently made of lighting conditions in industrial plants of 57 towns in Eastern states (an investigation conducted for a large lamp concern) indicates the sources of information that the manufacturers are likely to seek. Of those consulted, 24.7% declared that they would go to the electrical retailer for advice as to lighting changes; 20.7% to the electrical jobber; 13.2% to the consulting architect or engineer; 9.2% to the central station; 7.1% to their own electrician; 6.1% to the lamp manufacturer; 5.9% to their own architect or



engineer; 1.6% to their own superintendent; 0.5% to other manufacturers' engineers. Those who definitely said they would go "nowhere" for such advice constituted 1.9%; and 9.1% would go "elsewhere" or were doubtful.

It is a significant fact that, eliminating those who were doubtful as to whom they would consult, 72 per cent stated that they would go for advice on plant-lighting to the electrical distributor, or to someone in their own organization. In view of this interesting condition, it is apparent that electrical retailers, contractors, and wholesalers are expected by manufacturers to be qualified as "expert advisors" on industrial lighting. To their notice especially, therefore, is referred the new lighting code of California, that they may become thoroughly familiar with its provisions.

The principle of the ready-to-serve charge from time to time is challenged by consumers or communities who object to the payment of a tax for a service whose nature appears to them obscure. At the present time, for instance, the communities of central California are preparing to make a legal battle against the stand taken by the California Railroad Commission in favor of a ready-to-serve charge for water service. A large part of the criticism is due to the fact that the principle may be applied to electricity and other public utilities as well.

There has been a great deal of loose thinking on the subject, which in many respects has the elements of unpopularity involved in any form of direct taxation. Very little attention has been given the increase in value to property owners brought about by the mere existence of water mains, gas mains, and electric distribution systems in the streets. Strictly speaking, every property owner should stand some of the expense of up-keep of the distributing systems of these various utilities. This should not involve the entire cost of service, of course, where those actually making use of the water or electricity derive a greater benefit than those not so served, but should be a return for the service of the utility in bettering the standing and commercial values of the community as a whole. The ready-to-serve charge is a recognition of the fact that this universal benefit should not be paid for exclusively by those who consume the product. In strict justice, the payment should be made by all property owners, irrespective of actual connections, in the form possibly of a remission of taxes to the utility. The ready-to-serve charge is an attempt to collect this tax in a way which seems less painless to the public, who would always rather pay more for a product than pay a direct tax, so labeled. The principle is a sound

one and the progressive stand taken by the California Commission should be upheld.

From the use of solicitors by one or two of the largest electrical retail stores of the West, the practice has grown until there are over 120 solicitors in use in California alone and a great scarcity of available material is reported.

#### Possibilities of the Bonus System

There is no question but that the solicitor has proved himself a success. His commission is a high one, but it is recognized that the incentive must be adequate in order to attract the right type of man and to secure his full interest—and the return in volume of sales compensates the dealer for any profit he foregoes.

The bonus system for sales made over the counter is the application of this same principle to the interior salesman. The importance of an intelligently interested salesman in the shop can hardly be over-estimated. According to the service rendered through the salesman does the customer judge the intention of the proprietor. Actual test shows the value of the bonus system in bettering this service. A recent report from one of the progressive stores of southern California where the character of the employes was already above the ordinary, indicates that after the adoption of a bonus system, sales were greatly increased, even to the point of doubling in some instances. A simple form of rewards-for-service has been suggested by the California Electrical Cooperative Campaign for immediate adoption. There are many problems involved in the working out of a system which will actually best serve the individual business in practice, but the difficulties and advantages will show themselves in use, and the important matter is to adopt the system in some form and reap its immediate advantages.

There is much being said as to how the personal rating of the contractor-dealer may be best ascertained. It is evident that the rating of personality of the man located in the big city or in the community wherein changes are alive and active should be on a different basis than for the man located in a smaller town or even in a larger city when the city as a whole is dead.

#### Personal Rating of Contractor- Dealer

At best all ratings are more matters of comparison with similar standards. As a consequence the attention that is now being given to ratings of contractor-dealer stores in many communities of the West should be made pliable in comparison so that the type of community and business service prevailing in the locality in which the individual is situated might well come in for consideration.

## IN THE NEXT ISSUE

### Electricity in Los Angeles Terminal Warehouse



# Inventories and their Income Tax Procedure

BY NORMAN LOYALL McLAREN

(In this article is presented an up-to-the-minute statement on the requirements of a proper stock-taking, particularly timely for the electrical merchandiser at the first of the year. Recent important rulings of the Bureau of Internal Revenue, U. S. Treasury Department, are herein discussed. The author is a member of the firm of McLaren, Goode & Company, certified public accountants, San Francisco.\*—The Editor.)

Under date of October 10, 1919, the Bureau of Internal Revenue of the U. S. Treasury Department announced that a special drive to locate merchants and manufacturers who had followed erroneous methods in taking their inventories for the taxable years 1917 and 1918 was about to be made. In cases of voluntary disclosures, before investigation of failure to make proper return and payment, the policy of the Bureau, it was stated, would be to forego penalties, except where there was an intentional evasion of the tax. On the other hand, it was indicated that where discovery was made by Government officers, heavy penalties would apply. This announcement indicates the fairness of the Department's attitude toward taxpayers who have unintentionally failed to follow certain provisions of the Revenue Acts of 1917 and 1918.

## Methods of Stock-Taking

Under the Department's interpretation of both acts, inventories may be valued only at (a) cost or (b) cost or market value, whichever is lower. By far the greater portion of correctly prepared income tax returns for both years were made on basis (b), and in practically every line of business it is standard accounting practice to take inventories at "cost or market, whichever is lower."

Some of the erroneous methods of stock-taking referred to above are of the following classes:

1. Inventories taken on average cost where the articles making up the inventories could be "ear-marked" and valued at actual costs.
2. Deduction of flat percentages to provide for possible losses upon sale.
3. Inventories taken on fixed averages based upon prior year costs.
4. Inventories omitting goods in transit.
5. Inventories omitting goods consigned by the taxpayer.
6. Inventories priced below both cost and market and omitting some portion of the goods on hand or in transit whose title was vested in the taxpayer.

In the event that any of these incorrect methods have been followed amended returns should be prepared at the earliest possible date adjusting inventories to "cost or market, whichever is lower" rather than "cost" in accordance with the sound accounting principle that all losses should be provided for but that profits should never be anticipated.

## Change from Cash to Accrual Basis

Some merchants have followed the practice of making all income tax returns including the 1918 return on the basis of cash receipts and disbursements. This procedure is disallowed by the Department which has ruled in Article 1581 of Regulations 45 as follows:

"In order to reflect the net income correctly, inventories at the beginning and ending of the year are necessary in every case in which the production, purchase or sale of merchandise is an income-producing factor."

The application of this rule will make it very difficult for some merchants to prepare correct amended returns where inventories have never been taken. It will be possible, however, to arrive at approximately the correct amount of "gross profit on sales" by the following method:

1. Add to the total cash sales during the entire life of the business the accounts receivable at December 31, 1919, to determine the total sales for all years.
2. Add to the total cash purchases the aggregate of accounts payable at December 31, 1919, to arrive at total purchases.
3. Add to total purchases the stock in trade at the time the business was started and deduct the inventories at December 31, 1918 (prices at cost or market, whichever is lower), to determine the "cost of goods sold" for the life of the business.
4. Determine the percentage of gross profit on sales to total sales.
5. Apply this percentage to the corrected sales for each year to determine the "gross profit on sales" each year. The corrected sales may be obtained by pro-rating the accounts receivable over the years affected on any equitable basis, taking into consideration the growth or decline of the business and adding the pro-rated amounts to cash sales for each year.

The above computation appears at first glance to be more complicated than it is in reality, and if only "receipt and disbursement" returns have been made for past years it is essential to make the adjustments indicated when changing to an accrual basis; otherwise one year will reflect corrections which should be spread over several years.

As soon as the necessary adjustments are made amended returns should be prepared for the years affected. These may be filed at once or with the 1919 return at the office of the District Collector of Internal Revenue.

It may be stated parenthetically that where adjustments of this type are necessary the opportunity should be taken to review previous returns for other errors. Perhaps depreciation of fixed assets has not been properly calculated. Perhaps the owners of the business have not credited themselves with salaries to which they were fairly entitled. Perhaps interest was not calculated on temporary advances by the owners. Perhaps the item "bad debts" shown as a business expense was estimated, but not actually written off. Perhaps permanent improvements which should have been capitalized were charged to operations. These are a few of the items that may have to be readjusted.

## Adjustment of Inventories

Returning to the subject of this paper let us consider the adjustment of returns where inventories have been taken at the close of each fiscal period, but on an incorrect basis. If all the original inventory sheets have been preserved the recalcula-

\*The writer acknowledges indebtedness to "Montgomery's 1919 Income Tax Procedure" and "The Prentice-Hall Tax Service" for many suggestions embraced herein.



tion will be comparatively simple. Cost and market at the several closing dates may be obtained very readily from invoices and, where necessary, by correspondence with the concerns from whom the goods were purchased. Care must be taken to include goods in transit and on consignment. Inward freight should be added to the cost or market of the goods on hand and outward freights to the consigned goods, but where freight is estimated it is important not to include freight on goods in transit. Goods consigned to the taxpayer or which have been sold and are being held for customers should never be taken into the closing inventory.

The importance of proper recording and safe-keeping of the original inventory cannot be over-emphasized. Aside from the Department's instructions to all taxpayers, to preserve these sheets as part of their accounting records, their preservation may mean the saving of a considerable sum upon adjustment of a possible fire loss. Inventories should be legibly recorded on specially prepared "Inventory Forms" which can be obtained from any stationer. Count of quantities, footings and extensions should be verified by independent check. As soon as the summaries are transferred to the general books the original sheets should be securely bound and filed in a fire-proof receptacle.

Probably the only questions that will arise in pricing the inventories at "cost or market, whichever is lower" will be the treatment of cash discounts on purchases, and the treatment of purchases at different prices. With regard to cash discounts it is immaterial as to whether or not these are considered to be applied to reducing the cost of purchases or treated as miscellaneous income provided the taxpayer treats this item consistently from year to year. However, most accounting authorities favor the former procedure.

#### Purchases at Different Prices

With reference to purchases at different prices, where the goods on hand at the close of the period cannot be "ear-marked," inventories should be taken at the most recent purchase price to the extent of the last purchases. When quantities on hand at the close of the period exceed the last purchase, the balance should be applied to the next preceding purchase and so on. The above remarks apply only where cost is no greater than market at the closing date. In article 1584 of regulations 45, the Department has ruled with regard to inventories at market as follows:

"Market means the current bid price prevailing at the date of the inventory for the particular merchandise, and is applicable to goods purchased and on hand and to basic materials in goods in process of manufacture and in finished goods on hand, exclusive, however, of goods on hand or in process of manufacture for delivery upon firm sales contracts at fixed prices entered into before the date of the inventory. Where no open market quotations are available the taxpayer must use such evidence of a fair market price at the date or dates nearest the inventory as may be available to him, such as specific transactions in reasonable volume entered into in good faith or compensation paid for cancellation of contracts for purchase commitments. The burden of proof will rest upon the taxpayer in each case to satisfy the Commissioner of the correctness of the prices adopted."

Recognizing that in the latter part of 1918, by reason among other things of governmental control

not having been relinquished, conditions were abnormal, the Revenue Act of 1918 provided in Section 214 for losses arising from over-valuation of inventories. However, contrary to the opinion prevalent at the time the Act was drawn, prices of most commodities advanced rather than declined, and the majority of taxpayers will not have occasion to apply this relief provision.

#### Installment Sales

Where goods are sold on the installment plan the Department has ruled as follows:

"In the sale of personal property on the installment plan the income to be returned by the vendor will be that proportion of each installment payment which the gross profit to be realized when the property is paid for bears to the gross contract price." Where inventories are used to arrive at gross profit on sales, the correct amount to be returned as income in a given period is as follows:

1. Deduct the amount of deferred installments from total sales. This calculation will give corrected sales.
2. In preparing the tax return enter as "sales" the corrected sales figure and as "cost of goods sold" the same percentage of the book cost of goods sold as corrected sales bears to book sales.
3. Determine the percentage of gross profit to book sales and apply this percentage to corrected sales. This calculation will give corrected gross profit on sales.

A practical example of these adjustments is as follows:

	Books	Corrected
Book Sales .....	\$500,000.00	\$500,000.00
Less Deferred Installments .....		100,000.00
Corrected Sales.....		\$400,000.00
Beginning Inventory..\$ 40,000.00		
Purchases .....	410,000.00	
	450,000.00	
Less Closing Inventory .....	50,000.00	
Cost of Goods sold.....	400,000.00	
Gross Book Profit on Sales .....	\$100,000.00	
Percentage of \$100,000 (Gross Profit) to \$500,000 Gross Sales)—20%		
Corrected cost of goods sold (80% of \$400,000)		320,000.00
Corrected Gross Profit on Sales (80% of \$100,000)		\$ 80,000.00

#### Summary

1. All returns of merchants and traders should be made on an accrual basis.
2. Inventories should be priced at cost or market, whichever is lower.
3. Amended returns should be prepared correcting errors of previous years, with particular reference to inventories.
4. Cash discounts should be deducted from the purchase price in arriving at the cost of goods.
5. Profit credited in the books on installment sales should be adjusted to include only profit on installments actually due at closing date.
6. If goods included in the inventory at December 31, 1918, have been sold during the year at a lower price than inventory figures, an amended return for 1918 should be prepared claiming an abatement or refund on this account.





A district office display room of the Southern California Edison Company. A display room is one of a power company's best salesmen if well designed and organized. There should be plenty of light, an effect of spaciousness,

and no suggestion of overcrowding in the display arrangement. Notice the jeweler's cases for exhibiting appliances; also the use of pictures and flowers.

## The Display Room

BY S. M. KENNEDY

(A display room is an investment upon which a power company can afford to spend considerable time and thought. The general agent of the Southern California Edison Company here reviews some of the factors which make the display room a successful medium for educating the public electrically and increasing the sale of appliances. This is the fifth article of the series by the same author on power company practice.—The Editor.)

There are three branches of the electrical industry directly interested in the sale and distribution of all kinds and varieties of electrical appliances, but each class is interested from a different angle. The first class is the manufacturer who wants a market for his products, his particular desire being to induce those in the second and third classes to act as his distributors. The second class comprises the jobber and dealer, and they are both merchants looking for a merchandising profit. Their interest in a sale usually ends with the delivery of the goods. The third class is the central station company and its main object is not a merchandising profit, but a greater and more diversified connected load. The interest of those in the third class only begins with the delivery of the goods; and their benefit is continuous, like the brook that "goes on forever." Because the various branches of the industry are interested in this important matter, there should be a broad cooperation existing between all concerned, so that the demand may be created and the field more quickly and more effectually covered.

### The Display Room as Salesman

From the standpoint of the electric company, there are three principal ways of reaching the public, in order to create and stimulate the demand

for electric energy and increase the output of the central station plant. The first is personal solicitation, the second advertising, and the third the well-appointed display room. Now, as a matter of fact, advertising seldom carries the persuasion which closes a contract; it takes the personal solicitation, or the kind of conviction that is produced by actual observation, to obtain the signature of a prospect to an electric service agreement. Consequently, experience has shown that the display room is not only a valuable concomitant in connection with advertising, and a useful assistant to the salesman, but is in itself of incalculable benefit to an electrical distributing company. It is a means of directing the attention of the public to the actual operation of various electrical devices, and thereby aids in attaining the most desired objective of the company, that is, the building up of a profitable load for every hour of the day. There cannot be too many properly operated display rooms in a community. The manufacturer, the dealer and the central station may each have one on the same street without hurting each other, and, as a consequence, many more appliances will be sold. If the manufacturer establishes an exhibit in a busy center—he often creates a demand which is cashed in by the dealer. If the central station maintains



a display room it helps itself—stimulates business for the dealer and increases sales in various directions which develop business for the manufacturer. And as for the dealer, he becomes a public benefactor. In addition to the lasting benefit which he confers upon his customer by inducing him to acquire



Display room of the H. L. Miller Company, Pasadena, Cal. A display room should be as commodious as possible to accommodate the free coming and going of visitors.

and use a tried and tested electrical appliance, he obtains a profit for himself—keeps the wheels of the manufacturer in more continuous motion, and adds to the central station's constant load and income. This is the cooperation which really cooperates, and leads to a closer and more beneficial connection among the various branches of the electrical industry.

In order properly to analyze the advantages and uses of the display room, the subject may be studied from three angles: (a) appointments and methods; (b) value of demonstrations; (c) value of food exhibits in connection with display rooms. A brief consideration of each angle may be of interest.

#### Appointments and Methods

In considering the fitting up of a display room, the first questions to settle are those pertaining to situation and size. The room should be centrally located in the business portion of the community, past which many people are continually coming and going. There is little use locating a display room on an out-of-the-way street—to a large extent this would be like wasting powder and shot. The room should be commodious and of sufficient area to permit of the proper display of all apparatus and appliances which are to be exhibited, and at the same time allow a free access for visitors to move about without crowding. An over-crowded display room defeats its purpose. If the space is not ample it is better to display fewer appliances and show them to advantage. The size of the room has little relation to the size of the community in which it is located. There should be as large an exhibit in a town of 5,000 people as in a city with a population of 50,000—because the number and variety of appliances which it is desirable to put before the public is the same in each case.

The display room should be bright, clean and inviting at all times. Particular attention should be given to the color scheme and illumination. The veriest novice in the business can realize that unless the room is attractive in itself, the advantages to be obtained may be minimized, if not altogether lost. The display room should contain abundant stock and nothing but electrical goods. The samples on exhibition should be scrupulously clean. If an electric fan is being shown with dust on its base, and fly marks on the blades, the customer will not be as much impressed as if there were a clean base and shining blades. If a customer is looking at an elec-



Display room of the F. E. Newbery Electric Company, Los Angeles, Cal. If all appliances have the price clearly marked, they will often sell themselves—a great advantage during a busy period.

tric toaster which has previously been used for demonstrating, and the bottom contains stale crumbs and dust, it will not make the same impression as if the appliance were in a spick and span condition.

In the display room, the many appliances for various kinds of uses should be segregated into



Display room of Winder & Jones, Covina, California. As far as possible the different appliances should be segregated into groups so that several designs of the one appliance may be conveniently inspected.

groups, so that all pertaining to any particular use may be within easy reach. Lamp exhibits should be in one class and so arranged that the illuminating effect of any one lamp could be best demonstrated when the current is turned on. This method also permits of easy comparison as to the relative effects



of different lamps. All appliances which are used in the office or store should be together. All appliances for household use should be assembled by themselves. Appliances for the workshop and factory properly belong to another class and should be located where they may be shown to advantage and not weaken the attractiveness of some other devices which often sell on their appearance. As far as possible, specimens of each type of appliance should be connected up, so that the current may be readily turned on, and their operation demonstrated. Wherever space is available, such appliances as are not complete in themselves should be connected to apparatus and contrivances which are adapted to the use of electric energy for their operation. This applies to sewing machines, dish washers, coffee grinders, lathes and many of the other small devices which may be successfully operated by the use of direct connected or belt driven motors.

The usual display room of the dealer is located in his business establishment. It goes without saying that the exhibits should be in the front part of the room, and the staple goods in the rear. This means that all customers entering the store for any purpose must necessarily pass by and see the articles displayed. Stock and supplies maintained in the rear of the display room should be kept on clean shelves and tables, as neat and tidy as the room itself. One part cannot be untidy and careless-looking without affecting the appearance of the whole. Jewelers' show cases display the better goods to great advantage, and the cases are more useful still, if suitably illuminated.

#### Supplementary Features

Every lighting customer buys lamps and consequently lamps should be featured. Lamps of only the proper voltage for local circuits should be stocked—but lamps of every useful size and variety in the required voltage should be kept on hand and exhibited. Too much care cannot be given to all the details in connection with planning and arranging a proper show room. The money spent in suitably decorating and adequately wiring, and the current used in demonstrating are of little moment in comparison with the assured results accruing from a properly equipped exhibit. Tasteful literature is a factor which should not be overlooked. Visitors who have seen and become interested in appliances exhibited in a display room are willing to take home with them something which will refresh their memory, and enable them to talk the matter over with others who may be interested.

Neither the contractor-dealer nor the central station company should look upon a modern display room as only an opportunity to spend money for ornamental purposes. If properly conducted, it will not only pay its own way, but in addition will yield a handsome profit. Many contractor-dealers who formerly neglected their opportunities for merchandising, now find it is the most remunerative department of their business. Careful accounting methods are necessary for both contractor-dealers and central station companies, so that they may realize just what profit the display or salesroom is producing.

All appliances on exhibition should be ticketed and priced in plain figures. This saves time and, during busy hours or when help is scarce, the appliances will often sell themselves. If an article is not priced, and no salesman near, a consumer will fre-



Demonstrations by a first-class cook are among the most convincing of all selling arguments for electrical cooking apparatus, and a power company will do well to include special demonstration days in its plans.

quently lose interest. There can be no harm done in putting the price on an article in plain figures—and on the other hand a sale may be lost because the price is not clearly stated. Employees exhibiting or selling appliances should know the consumption of each device, the rate per kilowatt-hour for service supplied by the local central station company and also the cost per hour for operating any appliance shown. If such information is not available, the customer will often hesitate or postpone a purchase until the cost of operation is known and fully understood.

It is needless to say that good show windows should accompany electric display rooms. The best possible equipment is none too good for the show windows. This applies to the painting, color scheme, decoration, sign lettering and illumination. The more class to the window, the more attention it will draw and the more goods will be sold. Above all, taste and care should be used in displaying the appliances in the window. Better change the window often and display only one type of appliance at a time, than endeavor to exhibit a number of different kinds of appliances at once and over-crowd the window. There is great scope for originality and taste in arranging the window exhibit—and a good exhibit is well worth while.

#### Value of Special Demonstrations

While the display room should probably be as spacious in a small city as it would be in a larger one, at the same time the expense in maintaining the room and conducting demonstrations may be proportionately greater in the larger community. From the standpoint of the electric company, the display room may well be used as a means of educating the public in the use of the appliances exhibited. For this reason a company would be justified in having an expert in charge who could not only attend to



the every day duties in connection with the care of the display room, but also could give demonstrations on pre-arranged days. It goes without saying that the display room should be conducted under the general direction of the chief of the company's contracting department, and the dates for the different demonstrations should be so arranged that parties who would be particularly interested in any demonstration could be duly notified by the salesman. It might be a good plan to have a special demonstration one day each month. The demonstration should be preceded by a talk on the general character and utility of the appliances to be shown, and the salesman should be available to assist in the work of exhibiting and explaining the uses of the different devices. The special days should be divided in somewhat the same manner as suggested for the segregation of the exhibits in the display room. For instance, one day in each month might be given to electric cooking, and such a demonstration should have the assistance of a first-class cook so that the articles of food prepared and distributed may demonstrate how well they are cooked and how good they taste when electricity is used. During summer months special attention should be directed to those appliances which are particularly useful in hot weather, such as fans, cooking devices, small refrigerating plants, laundry machines, dish washers, vacuum cleaners, and the many appliances of the character which lighten work for the housewife. In the winter months, more attention might be given to electric heating appliances such as radiators, foot-warmers, heating pads, hot water bottles and the like. Now and then special demonstrations might be given for those interested in shop and factory work. There is a large field for development in this line, including such appliances as glue pots, soldering irons, breast drills, heaters, etc. However, the actual demonstration of such apparatus may not be suitable or appropriate in the ordinary display room, as usually such demonstrations would be more effective on the premises of the prospective purchasers. In a general way,

it has been found that demonstrations create interest and spread knowledge, where knowledge and interest did not previously exist, and that, if properly conducted, all demonstrations as to the use of electrical devices are quickly followed with increased amount of inquiries and more frequent sales.

#### Joint Electrical and Food Exhibits

While all classes of people are now beginning to be more familiar with the uses of electricity in daily life, the great majority as yet know little regarding its true usefulness as a labor saver and real servant of man. In the minds of many there is still a mystery about its generation and distribution, which is largely inherited and sometimes difficult to shake off. By means of electrical exhibitions the public is brought in closer touch with the handling of electric energy and the practical uses to which it may be put in every walk of life. It is true that every electric appliance installed in a home or shop becomes an exhibit in itself, but as a rule this exhibit is confined to the personal acquaintances of the one on whose premises the installation has been made. By means of the electrical exhibit the attention of the public is drawn to the advantages of electric energy in a general way as well as to some of the more unusual uses. Each individual who visits a display or exhibition, while he may look at the many kinds shown, will have his special hobby and will be more interested in those particular appliances which are nearest to his every-day work and method of living. It is true that one-half the world does not know how the other half lives, and it is also true that one-half of those using electricity do not know in what manner the other half is utilizing the same kind of energy. The prime value of the exhibit lies in the fact that it tends to bring the two halves together, allowing them to intermingle and absorb the knowledge gained from the experience of others.

The exhibition and preparation of certain articles of food in a display room is often of distinct advantage. There is cleanliness about the use of electrical energy for cooking purposes that makes



Window display of the Beacon Light Company, Los Angeles, California, featuring lamps. The best possible equipment is none too good for the show window, and the greatest care should be taken in selecting color scheme, decoration, and illumination. A tasteful window will attract many customers into the display room.



such an exhibit particularly attractive to the careful housewife—and as everyone must eat to live, the food exhibit is usually of interest to all, and a good adjunct to a display of cooking appliances. The adaptability of electric energy to the manufacture of foods is undeniable. The preparation and serving of all kinds of edibles can be demonstrated in such a manner that the brands of food, electrically prepared, become more interesting and more attractive to the public—the value of the food being enhanced and the consumption increased because electricity is used in its preparation.

The prime value from the central station standpoint of the display room and electrical exhibit is in stimulating the consumption of the company's product, and in adding business along lines which will be most profitable. There is a great diversity in the hours of use of all electrical appliances, and this diversity makes the added load very attractive to the company distributing electric energy. Most of such appliances are used during the daylight hours, when the average electric company has the least demand for its energy, and consequently the added load during off peak hours is unusually attractive. Again, most of the lamp socket appliances installed on the lines of an electric company mean additional load without additional investment, and the income from such added load is at the maximum rate per kilowatt-hour, as service is supplied through the lighting meter. This condition applies to all appliances using 600 watts or less and includes irons, toasters, percolators, chafing dishes, heating pads, foot warmers, radiators, vacuum cleaners, washing machines, fans, vibrators, and scores of other devices which may be put in operation in any room or place where circuits are installed for electric lighting. Such additional load does not mean the addition of more lines, transformers, services or meters, but on the other hand it produces a better utilization of the present investment—the ideal class of added business—the most desired by any central station manager. The more a company's lines can be packed with the lamp socket load, the nearer such company will have attained ideal operating conditions. There is a goal all good operators desire to reach, the gates of which are Minimum Investment, High Load Factor and

Maximum Rates. The lamp socket appliance load in sufficient quantity will open all three of these gates.

The Educational Factor

The properly conducted display room will naturally aid in removing from the public mind any prejudice regarding the use of electricity, either as to a mysterious uncertainty lurking in the background or as to the cost of service; and will do much to educate the people regarding the far-reaching advantages to be obtained from the use of the electric servant whenever and wherever possible. At the present time this applies particularly to energy used in the home. Reliable help is becoming scarcer and more expensive each month and a greater number of families are compelled to do their own housework. The uses of electricity materially lighten the labor in the home, and when this is fully realized the bugaboo of housework will gradually be lessened or entirely dispelled, and then the demand for electrically operated appliances will probably be greater than the supply. Further, the advantages of electric cooking are now beginning to be understood, and as the understanding increases, electricity will be more generally used in the kitchen, because of its cleanliness, convenience and utility. The question of comparative fuel cost will eventually be of little moment. House lighting may still be done by means of other illuminants at less cost than by electricity, but because of its compensating advantages almost everyone wants electric lighting. The same condition will one day prevail regarding electric cooking. There are compensating advantages in saving of time and labor, and in quantity and quality of food cooked, that far out-weigh any minor consideration such as fuel cost. The time is not far distant when all central station operators will require to be prepared for the load which is coming from this direction. The main factors which will hasten the day are exhibition, demonstration, education and the maintenance of high grade service to all cooking installations already made. In this connection well conducted display rooms keep electrical matters constantly before the public, and are of real educational service to consumers and at the same time of distinct advantage to all branches of the industry.

APRIL						
S.	M.	T.	W.	T.	F.	S.
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13	14	15	16	17	18	19
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27	28	29	30			

An advertising device used by the Western Colorado Power Company to promote the sale of electric washing machines. On the back of each calendar slip are illustrations of washing machines with descriptive reading matter.

Cut Out the Blue Mondays



# Electrical Statistics From the Northwest

(Development of all branches of the electrical industry in the West has been phenomenal during the past few years. The following figures, giving some idea of the resources and growth of the Northwest, are typical of the steady expansion which is in progress on the Pacific Coast.—The Editor.)

## Oregon's Water Power

### NO. 1. UNDEVELOPED PROJECTS WHICH HAVE BEEN INVESTIGATED BY THE STATE

Stream	Project	Continuous Horsepower	8 Months Season Horsepower	River Discharge	Head	Estimated Cost	Remarks
Columbia	Cascade	200,000	420,000	50,000 S.F. Min.*	44 ft.	\$11,000,000.00	Est. exclu. of dam.
Columbia	The Dalles	480,000	800,000	50,000 " "	45 to 105 ft.	50,000,000.00	
Columbia	Umatilla	120,000	320,000	40,000 " "	35 ft.	20,500,000.00	Est. for 320,000 e.h.p.
Deschutes	Moody	54,000		4,500 " "	132 ft.	4,560,000.00	3 mi. from Col. R.
Deschutes	Lockit	28,630		4,500 " "	70 ft.	1,901,000.00	14 mi. from Col. R.
Deschutes	Reclamation	37,600		4,500 " "	92 ft.	2,328,000.00	20 mi. from Col. R.
Deschutes	Sinamon	35,600		4,500 " "	87 ft.	1,778,000.00	29 mi. from Col. R.
Deschutes	Oak Brook	26,500		4,500 " "	65 ft.	1,610,000.00	37 mi. from Col. R.
Deschutes	Sheras Falls	40,900		4,500 " "	100 ft.	3,742,000.00	44 mi. from Col. R.
Deschutes	Oak Springs	10,820		3,700 " "	32 ft.	1,254,000.00	49 mi. from Col. R.
Deschutes	Maupin	44,500		3,700 " "	132 ft.	4,472,500.00	53 mi. from Col. R.
Deschutes	Freida	47,360		3,700 " "	140 ft.	4,716,800.00	63 mi. from Col. R.
Deschutes	White Horse Rapids	47,200		3,700 " "	138 ft.	3,039,000.00	77 mi. from Col. R.
Deschutes	Coleman	19,680		3,700 " "	58 ft.	1,840,000.00	89 mi. from Col. R.
Deschutes	Mecca	27,760		3,400 " "	90 ft.	1,878,800.00	98 mi. from Col. R.
Deschutes	Pelton	18,560		3,400 " "	60 ft.	1,052,800.00	107 mi. from Col. R.
Deschutes	Metolius	64,960		3,400 " "	210 ft.	3,954,800.00	111 mi. from Col. R.
Metolius	Riggs	17,200		1,400 " "	135 ft.	1,626,000.00	
Metolius	White Water	28,360		1,200 " "	260 ft.	2,115,800.00	
Metolius	Jefferson Creek	36,360		1,000 " "	400 ft.	2,751,800.00	
Metolius	Jacks Creek	16,360		600 " "	300 ft.	2,781,800.00	
Snake	Palouse Rapids	50,000		17,000 " "	32 ft.	4,500,000.00	With storage.
Snake	Asotin	80,000		15,000 " "	60 ft.	6,600,000.00	With storage.
Snake	Coon Hollow	200,000		15,000 " "	210 ft.	15,200,000.00	
Snake	Cherry Creek	300,000		15,000 " "	200 ft.	18,100,000.00	With storage.
Snake	Mountain Sheep	300,000		15,000 " "	210 ft.	16,400,000.00	With storage
Snake	Salmon Riv. Tunnel	200,000		4,000 " "	505 to 530 ft.	19,215,000.00	
Rogue	Devils Stair	30,000		1,350 " "	100 ft.	2,100,000.00	
Rogue	Horseshoe Bend	30,000		1,350 " "	110 ft.	2,100,000.00	
Klamath	Klamath Falls	70,000		1,160 " "	700 ft.	6,400,000.00	
Totals:		2,662,350		*Stream flow minutes		\$219,518,100.00	

### NO. 3. DEVELOPED AND PARTIALLY DEVELOPED PROJECTS

Stream	Date of Filing	Total Theoretical Horsepower	PowerNow Developed	Stream	Date of Filing	Total Theoretical Horsepower	PowerNow Developed
Rock Creek	1903	2045	1500	Rock Creek		205	205
Mill Creek		614	614	Santiam River		1078	1078
Sheep Creek	1901	750	750	Wallowa River		426	426
Lake and Lost Creeks	1902	3409	3409	Bridal Veil		787	787
Mill Creek and Santiam	1859	1804	1804	North Fork Santiam River		600	None
North Fork Santiam	1857	650	200	Mill, Bar & Red Blanket Cks.		5645	None
Willamette River	1860	600	600	Klamath River		588	588
Walla Walla River	1887	563	563	Klamath River		1500	None
Tualatin River	1878	6818	3000	Eagle Cap Reservoir		525	None
Fruit and Horse Creeks		252	252	East Fork Pine Creek		271	271
East Fork Hood River	1905	1219	1219	South Fork Umpqua River		341	341
Umatilla River	1870	685	685	North Fork Rogue River		22727	6000
Wallowa River	1907	410	410	North Santiam River		205	None
South Fork Santiam	1874	1023	1023	Willamette River		887	887
Santiam River	1870	200	200	Big Butte & Ginger Creeks		312	None
South Santiam River	Prior to 1909	897	897	Rogue River		500	200
North Santiam River	1866	1500	1500	Totals:		487,187	151,452
North Umpqua River	1891	961	961				
Mill Creek	1876	273	273				
Molalla River	1909	239	239				
Hood River	Prior to 1909	10227	1000				
White River	Prior to 1909	4233	3000				
S. Fk. Walla Walla River	Prior to 1909	6564	3500				
Mill Creek	1909	569	None				
Crooked River	1910	5000	2500				
Rogue River		3000	None				
Warner Creek		2525	None				
Pine Creek		500	500				
Clackamas River		15000	None				
Loon Lake Reservoir & Mill Cr.		1218	None				
North Umpqua River		5454	None				
Clackamas River		11705	None				
Sandy Creek		20000	None				
Zig Zag & Walla Walla Rivers		460	460				
Clackamas River		36818	None				
Sandy & Little Sandy		36932	20000				
Pine Creek		200	200				
Three Links Cr., Oak Grove Fk. of		57272	20000				
Clackamas River, Baker C.		300	300				
West Fork Deschutes River		9546	2000				
Deschutes River		3409	1500				
Hood River		11818	5000				
Deschutes River		5000	1000				
McKenzie River		10750	2000				
Right Fork Rocky Gulch		425	None				
Clackamas River		28409	None				
Willamette River		136363	50000				
Silver Creek		1875	1875				
Rogue River		3409	3409				
Powder River		409	409				
Link River		563	563				
Link River		1118	1118				
Wallowa River		236	236				

### NO. 2. OTHER POWER POSSIBILITIES WHICH HAVE NOT BEEN INVESTIGATED BY THE STATE

Stream	Flow	No. of Sites	Horsepower
Clackamas River	1,000 sec. ft.	1	11,700
McKenzie River	600	4	195,000
Umpqua River	1,000	2	32,700
Santiam River	500 to 750 sec. ft.	4	52,500
Total.....			291,900

### SUMMARY

No. 1 Undeveloped Projects Investigated by the State.....	2,662,350 hp.
No. 2. Other Power Possibilities.....	291,900 hp.
Developed and Partially Developed Projects.....	487,187 hp.
Totals.....	3,441,437 hp.

Of this total horsepower reported it is estimated that there is actually developed and being used 151,452 hp., as shown under No. 3 above; or less than five per cent of the total horsepower above listed. While developed projects of less than 200 horsepower have not been listed it will be noted that the un-



developed projects reported are in most cases not complete development of the streams covered, also that there are hundreds of smaller power possibilities throughout the state that have not been investigated.

HYDROELECTRIC POWER POSSIBILITIES  
IN PUGET SOUND DISTRICT

BY J. J. WETTRICK

The waterpower tributary to the Puget Sound region I have arbitrarily assumed to be the power found in the streams of the western slope of the Cascade Mountains from the Columbia River to British Columbia, the eastern slope of the Olympics, the Klickitat River and one-half of that in the Columbia River between Celilo and the mouth of the Cowlitz River. There are many good power sites capable of large development on the Yakima River and other tributaries of the Columbia, and the Columbia River itself that are nearer Seattle and Puget Sound than some of those included in the above territory, but it is thought that this power can readily find profitable employment in the commercial and irrigation industries in the great region to the east of the Cascade Mountains.

In the region above described, reports of the United States Geological Survey (on basis of maximum continuous power on the turbine shaft) give the rivers flowing into the Columbia, including the Klickitat, White Salmon, Little White Salmon, North and South forks of Lewis River, The Toutle and Cowlitz rivers a total of 494,550 horsepower. Investigations show that with economically possible storage this amount could be doubled, making a total of approximately 989,000 horsepower continuous.

The Nisqually, White, Puyallup and Cedar rivers are given totals of 215,970 and 127,280 horsepower, according as they are considered with or without storage. Continuing on north are the Snoqualmie with 60,000 horsepower, Sultan River with 25,000, the Whitechuck, Sauk, Skagit, Nooksack, Stillaguamish, Skykomish and other small rivers for which no government estimates are available, but which would in all probability furnish in the neighborhood of 300,000 horsepower.

On the eastern slope of the Olympic Mountains is the Lake Cushman project, which has been estimated to be capable of developing anywhere from 30,000 to 150,000 horsepower continuous. The Elwha River, on which an 8,000 horsepower plant is now practically completed, according to estimates of competent engineers, is capable of development to the extent of furnishing 35,000 horsepower continuous. Other streams in the eastern portion of Clallam and Jefferson counties have been estimated to be capable of furnishing 50,000 horsepower continuous.

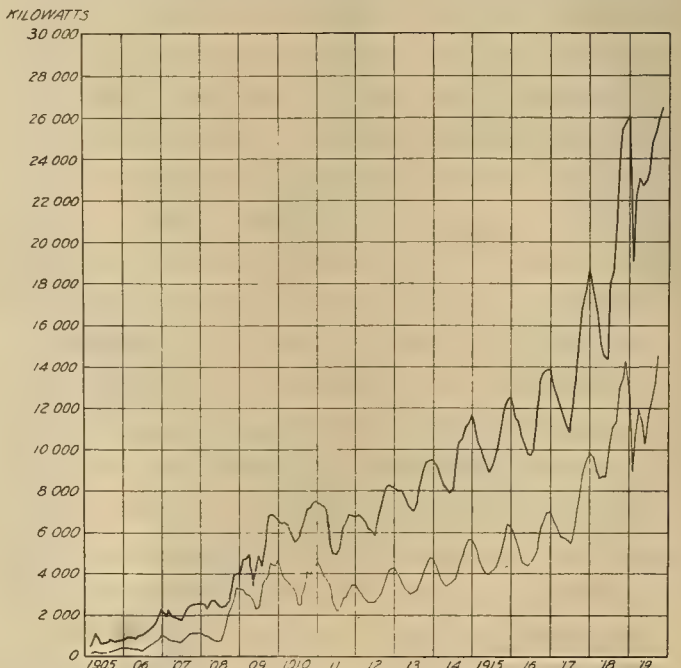
Then there is the Columbia River, the greatest of them all. At one point on this river, between Celilo and The Dalles, it is estimated that 300,000 electric horsepower continuous can be developed and generated at a cost of \$7.00 per horsepower year and an additional 236,000 horsepower for eight months of the year. These estimates are by John H. Lewis,

State Engineer of Oregon, and he makes the further statement that "an additional one million horsepower can be developed at a cost of \$44.00 per horsepower and furnished at a cost of \$4.50 per horsepower year, "thus making a total of approximately one and a half million horsepower for this one site. Assuming that one-half of this or 750,000 horsepower is available for Washington, letting the other one-half go to Oregon, and adding to this the various other amounts above mentioned, we have the amazing total of 2,455,000 horsepower available in the Puget Sound region. This total, while based for the greater part on comparatively rough government estimates, can be said to be a very conservative estimate.

WATER POWERS OF THE STATE OF WASHINGTON  
(From preliminary and reconnaissance notes prepared by the Department of Engineering of the University of Washington.)

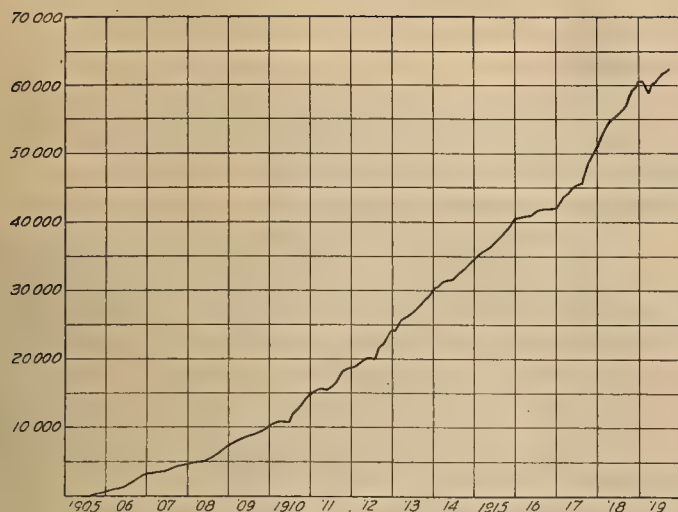
Drainage area	HP.	HP.
	Entire 12 months at cost of \$1.50 per HP. or less	Estimated average for year irrespective of distribution or cost
1. Cowlitz River.....	230,000	1,500,000
2. Toutle River.....	48,000	320,000
3. Lewis River.....	55,000	450,000
4. White Salmon River.....	60,000	220,000
5. Nisqually River.....	45,000	225,000
6. Puyallup River.....	40,000	175,000
7. White River.....	110,000	285,000
8. Cedar River.....	75,000	200,000
9. Snoqualmie River.....	100,000	400,000
10. Skykomish River.....	85,000	240,000
11. Stillaguamish River.....	50,000	220,000
12. Skagit River.....	250,000	1,200,000
13. Klickitat River.....	118,000	300,000
14. Chelan River.....	300,000	500,000
15. Spokane River.....	80,000	240,000
16. The Olympics.....	160,000	850,000
17. Columbia River (with tributaries not mentioned) .....	750,000	5,800,000
Total .....	2,556,000	13,125,000

CHARTS SHOWING GROWTH OF SEATTLE  
MUNICIPAL LIGHT AND POWER SYSTEM

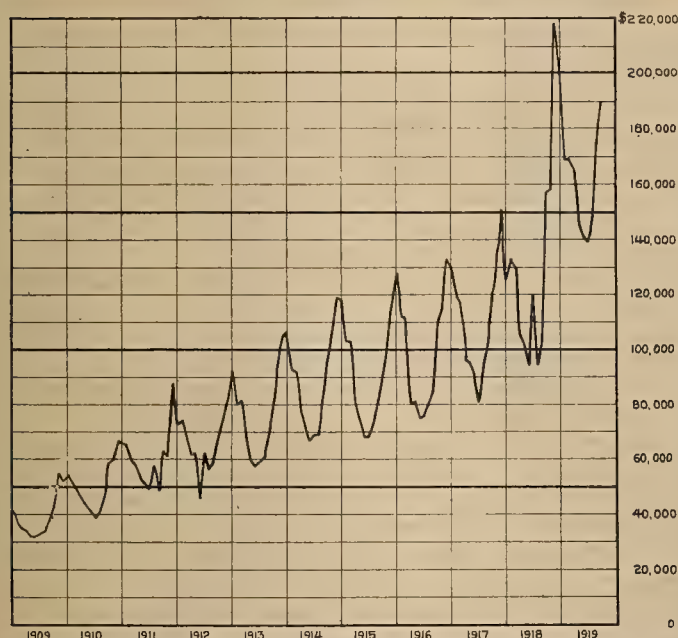


Maximum and average load by months in the Seattle municipal power plant. Household appliances have become an appreciable proportion of the load on the system during the last five months.





Number of customers on the Seattle municipal light and power system between the years 1905 and 1919. The steady increase is indicative of the growing popularity of electricity in industries and in the home.



Monthly earnings of the Seattle municipal light and power system. The unusual increase in load and revenues in 1917, 1918 and 1919 was due to shipyards and allied industries. Electric steel furnaces have also become an important load in the last three years, and the household appliance load has increased by about one-third during 1918 and 1919.

### MANUFACTURES CENSUS

Special effort is being put forth to make the manufactures section of the approaching Fourteenth Decennial Census the most complete and comprehensive inventory of the Nation's manufacturing establishments ever taken, according to officials of the Bureau of Census who have this work in charge.

The schedules which will be used in tabulating the information about the country's industrial resources have already been prepared and printed. These schedules will be mailed to every manufacturing establishment in the United States so that factory owners and managers can familiarize themselves in advance with the questions to be answered when the records of the past year's business have been compiled. The questions relate to the calendar year 1919.

In 1914, the year the last manufactures census was taken, about 275,000 manufacturing establishments were listed by the Census Bureau. This time more than 300,000 establishments will be sent schedules. In addition to this it is expected that about 50,000 mines and quarries will also be reported.

The inquiries relating to manufactures, as specified by the Act of Congress providing for the census, include the name and location of each manufacturing establishment; character of organization, whether individual, corporate or other form; character of business or kind of goods manufactured; amount of capital actually invested; number of proprietors, firm members, copartners and officers, together with the amount of their salaries; number of employees and amount of their wages; quantity and cost of materials used in each establishment; quantity and value of products; principal miscellaneous expenses; time in operation during the year; character and quantity of power used; and character and number of machines employed.

The questions as outlined above will be covered by the general schedule which every establishment will receive. In addition to this a supplemental schedule will be sent to the 68 principal industries as classified by the Census Bureau. This supplemental schedule will allow detailed statistics of output to be set forth under the heading "products manufactured."

The census of manufactures is limited to manufacturing establishments with an annual product of at least \$500 conducted under what is known as the factory system, exclusive of the so-called neighborhood, household and hand industries. However, no establishment is too small to be counted by the government if it comes within the definition of a manufacturing establishment.

Census Bureau officials emphasize the fact that all information gathered by the census is strictly confidential, made so by the Act of Congress, and is for general statistical purposes only. The same is true of the censuses of population, agriculture, mines and quarries, oil and gas wells and forestry and forest products.

Many startling figures are expected to be shown by the approaching compilation inasmuch as the industries of the country were for the most part in a subnormal condition in 1914, the year the last manufacturing census was taken.

### ELECTRIC LIGHT AND POWER STATISTICS FOR OREGON

Figures regarding electric light and power companies, given in the eleventh annual report of the Public Service Commission of Oregon, show the growth of the electrical industry in Oregon as follows:

	Fixed Capital Installed			No. of Electric Customers in Oregon
	Entire System	Oregon State	Oregon Electric only	
1916	\$139,991,837.38	\$68,491,717.79	\$ 8,603,615.76	84,172
1917	142,349,147.38	74,316,051.73	12,045,065.99	88,236



## TAKING AN INVENTORY

BY H. R. OLSON

(A practical inventory method for wholesalers, and one which has worked out successfully in a large electrical concern, is here described by the bookkeeper and cashier of the Pacific States Electric Company of Portland, Ore.—The Editor.)

The subject of inventory is of particular importance at this time of the year, many firms closing their fiscal year with the calendar year, and many others taking inventory shortly after the first of the year.

While there are many good plans for inventory, the one to be briefly outlined here has been found well adapted to the jobber stocking approximately five thousand items.

With this comparatively large number of items the actual count is completed within a short time; and the compilation, recording, and reconciliation of these figures against stock records is finished within a few days.

Naturally a schedule like this requires careful planning, a thorough understanding of the routine and procedure by each employee, and a complete co-ordination of all parts of the work.

We employ what is commonly known as a stock card record system—one card being used for each item of stock. On this card is a record of material ordered, received, and disbursed. A glance will show the stock of that particular item on hand. We operate several branches and use the same general plan at each office.

Well in advance of the actual inventory, the main office prepares for each district office an "Inventory Tag" for each stock card, different colored tags being used to designate different offices. For the purpose of this article, let us assume that the stocks at the respective offices are identical. The tags are numbered consecutively and in the same order as the stock cards.

At the same time, a "Cost Tag" is prepared for each stock card, and the items are costed in advance of the actual count. The cost tag is designed for tabulating the stock of the article at each office and arranged so that the district office value of the article will be available.

A few days before inventory, the tags are distributed in the respective warehouses and a survey is made to see that every item has a tag before the actual count is started.

We divide the employees into little crews composed of foremen and assistants, usually a foreman for each floor. It is the duty of the foreman to see that the count is taken, checked, and properly entered on tag, and that no items have been omitted in his section.

The tags are collected, arranged in numerical order, and compared with stock cards, the actual cost being entered on the district office cards. In cases where the count and the stock record differ, due to inaccuracies, a check of the stock is made to verify the original count before entry on cards.

When a district office has completed the card entries and all tags are accounted for, they are forwarded to the main office. That office transfers the

counts to the cost tags, computes the values, and makes up the final figures.

This plan could undoubtedly be used by any firm stocking a considerable number of items, and in particular by a firm operating more than one office.

## Western Ideas—

CUSTOMERS FOR SMALL MOTORS are more numerous and various than some electrical establishments realize. A number of valuable suggestions for prospects can be gleaned from the following recently compiled list:

### Small Power Users

In the laundry to drive the washing and ironing machines.

In the bakery to drive the dough mixers and kneading machines.

In the confectionery to turn ice cream freezers, chocolate mixers, etc.

In the dairy to turn the separator, churn and bottle washer.

In the printing plant to drive the big cylinder and the small job presses.

For mechanics who like to tinker about their own shops.

In garages where there are tools to sharpen and grind to be done.

In the repair shops where there are lathes, drill presses and grinding machines to drive.

In the pattern shops to turn the wood-working machines.

In saw and planing mills to replace the belt drives of the steam power plant.

In tin shops to operate the power-driven shears.

In awning shops and sail factories to drive the heavy sewing machines they use.

### Professional Men

In the dentist's office to turn his lathe and sharpen his tools.

In the optician's office to grind his lenses and keep his tools in good shape.

### Retail Dealers

In the window to provide special "motion" displays and turn the revolving table.

In the grocery store to drive the coffee grinder.

In the butcher shop to turn the meat grinder and bacon slicer.

In the jewelry shop to drive the repair man's lathe and for polishing the silverware.

In the tailor shop to drive his sewing machine.

In the furniture store to drive the sewing machines of the upholstery department.

In the department store for the same purpose.

### On the Farm

In the dairy to drive the milking machines.

In the dairy to drive the separator and turn the butter churn.

In the barn to drive the corn sheller and feed grinder.

In the spring house to drive the pump that supplies running water for the house and barn.

Mounted on a skid to drive the ensilage cutter and blower, saw wood, etc.

### In the Home

In the laundry to drive the washing machine and wringer.

In the laundry to drive the ironing machine.

In the basement to drive the soft water pump.

In the shop to turn the lathe and grindstone.

In the garage to sharpen tools and turn the lathe.

In the basement to turn the ice cream freezer.

THE GUARANTEE OF QUALITY which goes with a standard well-known make is the electrical dealer's greatest advantage over his competitors in the retail field. Other establishments may feature cheapness, mail-order facilities, and so forth, but the regular contractor-dealer has the big concerns of the industry directly behind him and is in a position to feature quality, and goods with an established reputation—and he should make this fact one of his main drawing cards.



# The Store Location

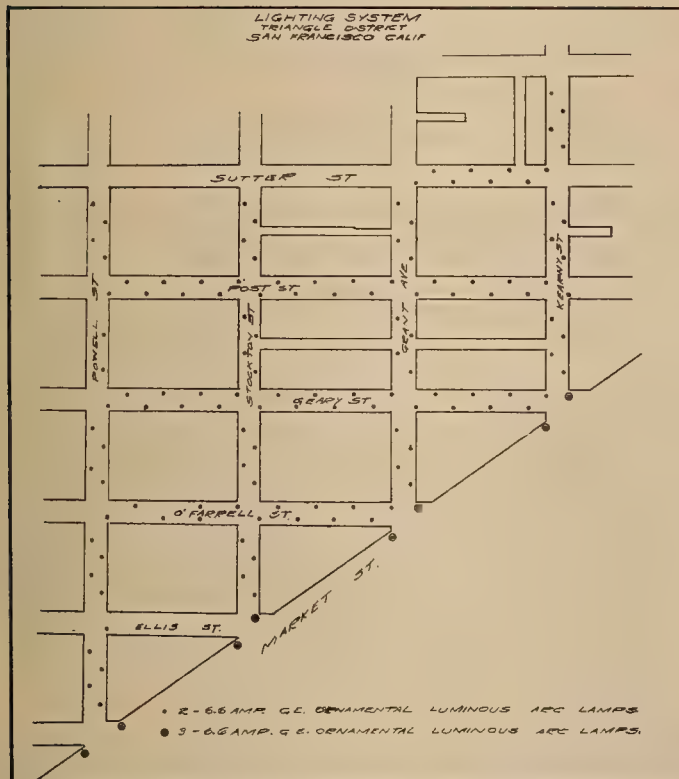
BY HOWARD ANGUS

(Figures show that the great majority of the buyers of electrical appliances are women. For this reason, if no other, it is important that the dealer locate his store in a district frequented by women shoppers. The following article by the secretary of the California Electrical Co-operative Campaign discusses the connection between location and business.—The Editor.)

The electrical contractor-dealers of California have completed one of the most prosperous years in their history. They are facing, together with the other forces of the electrical industry, what many predict will be the banner season to date. At this time each electrical contractor-dealer should be busy analyzing his business and discovering what were the salient features that made for his success in 1919, and what, if anything, retarded his progress. He should face 1920 with a carefully planned program. Efficiency in business coupled with better service to

## The Best Store-Situation —

As a general rule the best location is where the people gather in the greatest numbers. This might be further qualified and the best locations defined as those streets on which the women shoppers are the most numerous. Much of the purchasing for any family is done by the women. They are free during business hours of the day, while the head of a family is working. For instance, it has been discovered that a poor location is on the road that men take to or from a factory where they work. The reason for



The triangle district of San Francisco which includes most of the important stores of the city.

the public must of necessity be the keynote of this program and he should be determined that he will be contented only with more business than he did during the past year.

At this time the Advisory Committee of the California Electrical Co-operative Campaign wishes to call the electrical contractor-dealer's attention to the importance of store location.

It has been said that location makes or breaks a business. The Advisory Committee considers location of first importance to the electrical dealer, as it is to any other man engaged in retail merchandising. The Advisory Committee is convinced that many dealers were handicapped during the past year by poor locations and that they succeeded in many instances in spite of location rather than by its help.



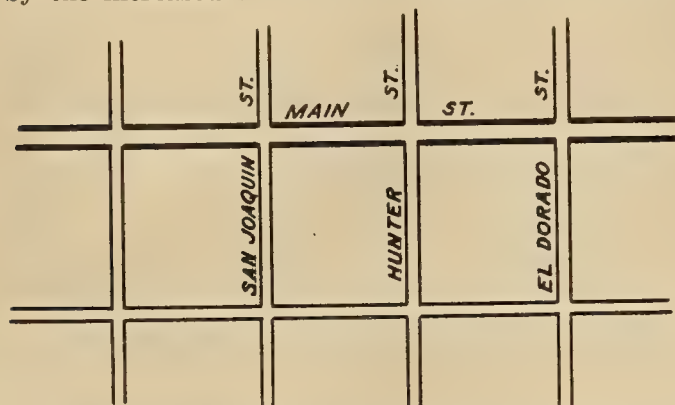
The Los Angeles "T," the scene of most of the retail shopping of the city, and the best location for stores.

this is that they are in a hurry to get to the factory and in a hurry to get home and have no time to make purchases; and another reason is because their wives, mothers or sisters do the buying and are not to be found on the street that leads to the factory. If this has been found true, and reliable authorities confirm it, then the electrical dealer should have his store where the women shoppers are most numerous. He has still another reason for seeking the streets where the women are, because he sells appliances and conveniences for the home, and practically all the buying for the home is at the instigation of the woman in charge of that home and the purchases made either by her or at her request.

In every city there is a district known as "the retail district" where women shop. This district has been established by time, and it would be difficult to break a woman from the habit of going to that district and seeking out another in which to make her purchases. This district as a general rule is marked by the large department stores, with the specialty merchants' shops sandwiched in between them. The streets that are traveled most frequently by women are those between these department stores and it is on these streets that the women do their "window shopping," make up their minds as to what they wish to buy and it is here that they eventually do make



the purchases, in nine cases out of ten. Merchants have learned from experience that these streets are the best streets, and the bidding by merchants for locations on them have forced up the rentals for these districts. The large rent they endeavor to overcome by the increased volume of business. Corner loca-



A triple cross, formed by one main street and three cross streets, comprise the majority of the good locations in the city of Stockton, Cal.

tions in this district are considered the best because the travelers of two streets pass the location.

#### Retail Districts in California Cities —

Usually in large cities these districts are clearly defined, although they do change in the course of years. In San Francisco, for instance, there is the Triangle, bounded by Market, Powell and Sutter streets. Within this district are most of the large department and other well-established retail stores. It is within this triangle that the large volume of the buying is done. In Oakland there is the quadrangle marked by Jefferson, Twelfth, Broadway and Sixteenth streets. In Los Angeles there is the "T,"



On the double track formed by "K" and "J" streets in Sacramento, Cal., is located the shopping centre of the city.

marked by Broadway from Fourth to Ninth and by Seventh street from Broadway to Hope street, with a brisk business on Spring and Main streets besides. In Sacramento "K" street is the heart of a retail district formed by the "K" and "J" streets "double track."

The next best location to a location in the heart of the retail district is close to this district and on some well defined avenue of approach to it. In other words these merchants established here are trying to catch the crowd, going and coming.

In large cities auxiliary shopping centers will be found in all of the residential districts. Here will be found butcher shops, grocery stores, drug stores and the like, and many electrical merchants

are conducting successful enterprises in these districts. As a general rule merchandising in one of these auxiliary centers is limited to the district. Of necessity the scope of the merchant's business is limited by his location and his work must be intensive rather than extensive.

Choice locations are next door to the power company where the consumers go to pay their bills, next to a moving picture theatre and at street car transfer points where people of necessity must stop and look around. These have been found, in many cases, of real monetary value to the retail merchant.

#### In the Small Town, the Main Street —

In smaller cities the main street is the shopping district and on that street is usually the best location for the electrical retailer. A location close to the bank is usually a good one; so is a location near the power company office.

The chief problem that every dealer has to face in considering a site in the retail district is the mat-



The quadrangle which embraces the main shopping district of Oakland, Cal.

ter of high rents. This he must overcome by the volume of his business. This can be built up through sales appeal to the passers in the street, by attractive windows and excellent service in the store. The reason for the dealer moving into the retail district is to secure greater volume of business, and in the securing and holding of that volume of business lies his success. There is a maxim among retailers that it is easier to be a successful merchant in a good location than in a poor one.

#### Instances of Importance of Location —

It might be well to cite some typical cases of what location has meant in businesses similar to that of the electrical dealer. There is a man in a certain large Pacific Coast city who owns a book store. It is located in the heart of the shopping district. His rent is \$1,750 per month. When asked how much location had contributed to the success of his business, this book dealer replied that it was the secret of his whole success. When asked what would he consider a just rental for any location other than in the center of the retail district he thought a while and said, "I would have to be given \$500 per month by the man who owned the building before I would even consider moving, and then I would probably turn down the proposition." In other words he estimated that his location was worth \$2,250 a month to him. He is at present a very wealthy man. He began with nothing.

Sometime ago in the same city there was a firm engaged in the sporting goods business. The store was not in this general shopping district. The two



men who comprised the firm dissolved partnership. One staid in the old location and the other moved into the heart of the retail district. The man who staid in the old location has only a mediocre business. The man who moved has made such a success out of his sporting goods business that he has been able to secure control of one of the large department stores of that city. While there may have been other contributing influences to the success of this book store man and this sporting goods dealer, the chief element of their success has been location—a subject which merits the serious consideration of every retailer.

While many other cases might be cited, these two are mentioned because the profits in their business are about the same as those of the electrical retail merchant and the class to which they cater is much more limited.

It might be well to call attention to the method employed by a certain tobacco corporation which has been very successful. Before a store of this concern

is even placed a careful study is made of the location and the actual number of possible cigar purchasers counted and tabulated according to the hours and days for at least a week's time.

It would be profitable to an electrical contractor-dealer to cultivate the acquaintance of some of the successful merchants in other lines of business who have made successes in the heart of the retail district. He will be no doubt surprised by the limitation of appeal of many of these merchants' wares and he will find that the possibilities in the businesses of many of them are more confined and restricted than his. He will discover to his satisfaction that by good business methods backed by a good location he can do as well as his successful business friends.

It is undoubtedly true that a store to realize the greatest success must be where the people are, and the store that is where the most people are will do the largest business because it reaches and appeals to the greatest number of possible prospects.

## Business and the Public Library in St. Paul

BY W. D. JOHNSTON

(Bringing the public library to the business man is largely a matter of advertising. The following article relates how a public library established a modern and effective business section, and how it keeps its facilities before the minds of those to whom they are intended to be of service. The author is librarian of the St. Paul Public Library.—The Editor.)

The success of our service to business men in St. Paul is due mainly to two things (1) the character of the collections made available for their use and (2) the extensive and persistent publicity which this branch of the library's service has received.

Perhaps the only remarkable thing about the collection is that it contains no antiquated material. In 1915 the library was destroyed by fire, and in restoring the collection little has been purchased in addition to current publications, and new editions of books which have proven of value.

I speak of this not with a view to suggesting the destruction of old books on business or any other subject; I want simply to urge the importance of separating them from the more up-to-date books, to emphasize the desirability of open shelf display of the more useful books, and decent interment for the less useful ones. It is the latter which too often discredit libraries among men of affairs, and stand in the way of the use of the books which are of practical value. A large collection of books is in itself forbidding to anyone except the academic personage, but when a large part, if not the major part, of the collection is of historical interest only, the collection is not only forbidding in appearance, but repulsive.

### Unique Publicity —

The most remarkable feature of the development of our business service, however, is the publicity which it has received through the newspapers, through business organizations and business houses and through the library's own publications.

The cooperation of the newspaper press was obtained by the Town Criers, the local association of ad men.

The library fire occurred April 27, 1915. On June 2, the Town Criers voted to appropriate one dollar per member for the establishment of a business department in the public library and appointed a library committee to formulate plans for levying a tax upon the rest of the business community and incidentally give as much publicity as possible to the new department at the library.

The manager of the St. Paul Daily News offered to publish a special Town Crier edition of the newspaper. An editorial staff was at once organized, the mayor of the city issued a proclamation, calling attention to the civic importance of the movement, and appointing June 17 as Town Criers library day, and posters announcing it were placed in store windows.

The special library edition of the News consisted of the regular edition of the newspaper enclosed in a special four-page section devoted to the Town Criers and their library project. This section contained articles on the business library, on libraries in business establishments and similar material. Among them were interviews with prominent men, editorials, and verse.

The business section of the city was districted and each Town Crier, a newsboy for the time, assigned a route. The automobiles that carried the Criers from the News office to their several districts were decorated with signs reading "Town Criers' Library Edition, Daily News." Each Crier wore a large round tag bearing the same legend, and also carried a coin box. Many newspapers sold at a premium, and as a result over four hundred dollars was raised for the establishment of the business library.



**A Book Department in the Local Newspaper —**  
More recently a book department has been established in the older of the two largest local

late arrivals at the public library. Edited by the city librarian." These book reviews, unlike those in most newspapers relate less to fiction than to other books of general interest; business books are featured as often as possible, partly on the theory that they should be more widely used,—it should be necessary to have as many copies of the more useful business books in a public library as we now have of the more popular fiction,—and partly on the theory that it is a good thing for business men to do some book reviewing. Among the books which have been discussed in this way in our columns recently are Gerstenberg's Principles of Business, Beatty's Corporation Schools, Cleveland's Funds and Their Uses, Shaw Company's How to Run a Wholesale Business at a Profit, and Moore's American Business in World Markets.

Special articles on the library service to business men and on the literature of subjects of interest to business men as well as news notes are published from time to time.

The advertising columns are employed by the library also, and business houses use library notes as insets in their advertisements.

I am not sure that business men read any advertisements except their own, but I am told that business women do, and business women, I believe, will soon rival business men as users of business literature, if they do not already.

### Miscellaneous Publicity —

If space permitted I should like to speak of the publicity which the service to business men has received through business organizations and business houses. Library committees of the Officemen's Association, the Credit Men's Association, and other business men's organizations have been equally active in assisting in the selection of books of special interest to their members, and in bringing them to their attention through bulletins, or circulars, and their program committee have arranged for talks on the library service and on business literature.

## BUSINESS BOOKS

An Index to Recent Books and Articles in  
Magazines of Interest to Business Men



Published monthly by the St. Paul Public Library

W. D. FRITZ, St. Paul Association of Credit Men, W. D. McLVANE, St. Paul Association of Office Men, W. F. OLDHAM, St. Paul Advertising Club  
Editors

VOL. I May, 1919. No. 32

### BUSINESS EXPERIENCE PLUS

In his new book, entitled Principles of business, Professor Gerstenberg says. Fortunately for the business man, testimony is becoming an ever-increasingly abundant source of business information. Ten years ago, there were few books indeed on business. Economic theory occupied the attention of students much more than the facts of business. Where then one or two books appeared now they are being written and published by the hundreds.

The business student of course, observes as well as reads. Today however so vast is the amount of information that must be acquired that testimony—as compared with direct observation—has become of relatively greater importance than it was under the old apprenticeship method of business education.

The reading of business books marks the passing of the old time provincialism in business.

### NEW BUSINESS BOOKS

Bank deposit building. W. R. Morehouse. N. Y. Bankers pub. co. 1918. 251 p. \$5.00. Discusses the following kinds of advertising as means of increasing business: newspaper, community window display, motion picture street car bank stationery and house organ with chapters on employee, contests, school savings banks and Christmas savings clubs. (1715)

Building, equipment and supplies. A. W. Shaw co. Chicago. 1919. 193 p. \$3.00. (Shaw banking series) Location and general construction, planning the interior, special equipment which pays how to reduce the cost of supplies. (1716)

Management and executive control. A. W. Shaw co. Chicago. 1919. 325 p. (Shaw banking series) \$3.00. Essentials of management. (1717)

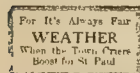
Joint and directors' division of work records and audits, hiring and training workers, profit-sharing plans and social activities, trust and savings methods, profit factors. (1717)

The successful salesman. Frank Farrington. Chicago. Laird & Lee. 1918. 208 p. \$1.00. The salesman, the customer, the goods, the catalog, co-operation with the house, honesty, optimism and push, selling yourself. (1718)

What a salesman should know about advertising. F. C. Aspley. Chicago. Dartnell. 1919. 112 p. \$1.00. How advertising helps a salesman who a trade mark means using advertising to close sales, the wait-for-me and buyer opposition to advertised brands, personal advertising. (1719)

A monthly publication issued by the St. Paul Public Library, in co-operation with representatives of local business organizations, is an up-to-date record of the best current business literature.

newspapers. The character of this is indicated by the caption placed over it: "New books reviewed by readers of St. Paul. They tell what they think of



## THE ST. PAUL DAILY NEWS

## TOWN CRIER LIBRARY EDITION

THIS NEWSPAPER RECEIVES THE FULL LEASED WIRE SERVICE OF THE UNITED PRESS ASSOCIATIONS

VOL. 16, NO. 107

ST. PAUL, MINNESOTA, THURSDAY, JUNE 17, 1915.

ANY PRICE YOU WISH TO PAY

### ST. PAUL BUSINESS MEN INDORSE IDEA FOR NEW LIBRARY

Great Value of Plan for Adequate Reference Department Is Emphasized by Men Who Realize the Great Need of Special Department Planned by the Town Criers

MEANS MORE AND BETTER BUSINESS FOR ALL ST. PAUL

Business men are realizing the value of a book in their business. A business reference library, which has been planned by the Town Criers, is being organized by a group of business men who are realizing the value of a book in their business. The library will be a place where business men can find the information they need for their business. It will be a place where business men can find the information they need for their business. It will be a place where business men can find the information they need for their business.

It is a well-known fact that business men are realizing the value of a book in their business. A business reference library, which has been planned by the Town Criers, is being organized by a group of business men who are realizing the value of a book in their business. The library will be a place where business men can find the information they need for their business. It will be a place where business men can find the information they need for their business. It will be a place where business men can find the information they need for their business.

Paving the Way to a Business Library . . . . . By "Bart"



### PRESIDENT VINCENT INDORSES THE IDEA

Noted Educator Thinks of the Importance of a Reference Library

President Vincent of the University of Minnesota has expressed his interest in the proposed business reference library. He has stated that such a library would be of great value to the business community and that it would be a place where business men could find the information they need for their business.

### TEN THOUSAND BIG BUSINESS MEN WILL GO TO CONVENTION

Secretary Lane Will Make Opening Address at the Great Gathering of Advertising Forces in Chicago, Beginning June 20—A. A. C. W. Has Active Members in 150 Clubs All Over the World

MOVEMENT GROWS IN ELEVEN YEARS FROM SMALL BEGINNING

The outstanding feature of the approaching convention of the Associated Advertising Clubs of the World at Chicago is that it will be a gathering of business men who are realizing the value of a book in their business. The convention will be a place where business men can find the information they need for their business. It will be a place where business men can find the information they need for their business. It will be a place where business men can find the information they need for their business.

Following the destruction of the St. Paul Public Library by fire a local newspaper issued a special library edition, in cooperation with the ad men of the city, to raise money for the establishment of a strong business department in the new library.



Individual business houses have followed their example, and have not only made the library service better known to employees but have done what they could to facilitate the circulation of books among them by securing traveling libraries for their use and arranging for messenger service between the library and the business house.

Of the library's own publications one is devoted to current business literature. It is entitled "Business Books," is edited in cooperation with representatives of three of the largest business men's organiza-

tions, and is distributed by the secretaries of these organizations to their members as well as to visitors to the library and to those on the library's mailing list.

In addition to this record of current business literature the library publishes lists on special subjects, both in folder form and in bookmark form. Among the former are lists on "advertising," "office work," "retail merchandising," "management," "employment," and "business finance." The latter cover a great variety of subjects.

## Progress of the Great Western Caribou Project



A view of the tunnel construction which is an important part of the Caribou project now being carried out by the Great Western Power Company on the North Fork of the Feather River. 40,000 kw. are to be developed, just above the present Las Plumas plant, which now develops 65,000 kw. at a head of 425 feet.



A sample of the country through which it was necessary to build a railway to connect the construction camps with the Western Pacific Railway. The broad-gage road, which is put through half the distance, connecting with a narrow-gage on the other side of the ridge, now passes along the strip of rock here shown.



In order to facilitate tunnel construction, a shaft has been sunk from the ridge, which permits of a three-way activity. The tunnel capacity is 60,000 kw. and it is expected that 120,000 kw. may ultimately be developed from this project.



The sawmill in Butt Valley, built to furnish lumber for construction work. The dam under construction is to be located just below this spot and the trees in the background of the picture will later be inundated.



# Office Records—Their Filing and Indexing

BY IRENE WARREN

(Records that cannot be found instantly when wanted are practically useless. Standardized, well-kept files are an invaluable asset to any business, and general principles regarding them are here discussed by the director of the Chicago School of Filing and Indexing, in the first of a series of twelve articles.—The Editor.)

## THE CENTRAL FILING SYSTEM AND DEPARTMENTAL FILES

The need for standardized filing and indexing has become universal in the business world. Every firm, government office, and association has materials to be filed. Whether the filing system be that of a



Stewart Warner Speedometer Corporation, Filing Department. Steel cabinets for current correspondence, with 2,600 division alphabetical guides. Transferred correspondence bound in volumes and filed on steel shelving. (Globe-Wernicke equipment.)

corporation having hundreds of drawers filled with correspondence and other filed materials, or merely the single file of the man whose place of business is only desk room in another's office, the fundamental principles of filing are the same and the availability of information in these files, when it is needed in a hurry, may mean the making or the breaking of a valuable contract.

Filing and indexing are concerned with two main types of material: one, the orderly arrangement of a collection of papers or pamphlets, the other, the systematic recording of information on cards or statistical sheets. Both are for purposes of preservation and reference.

In a large, complicated organization such as a department store, there are often more than fifty different records, most of them great in volume, such as correspondence, invoices, reports of various types—mainly papers in typewritten or handwritten form—besides all the material in printed form such as trade catalogs, government documents, pamphlets, books, pictures, lantern slides, which if of sufficient size and importance to the firm are collected into a department by themselves known as the business or commercial library.

Because of the varying nature and size of firms and the varying nature and size of the records, each

one worked out, often as the emergency compelled him to do, his own system for recording and arranging information or materials, with little regard to the general study of filing and indexing. In recent years, however, certain firms and individuals have succeeded in laying down some fundamental principles for the selecting, arranging, indexing, and use of business papers and information, and have developed some very satisfactory standardized equipment,



The Federal Reserve Bank in Chicago will be in cramped quarters until their new building is completed. A large volume of records is handled in a small space in a most satisfactory manner because every inch of space has been carefully planned, furniture placed so as to economize effort, order and system worked out for every detail and a daily routine planned by which all new records are filed away each day with dispatch and accuracy. The papers, sometimes varying in size, are placed in folders with such care that they are never torn or crumpled and are always readily accessible. Note the provisions for adequate lighting and ventilation.

supplies, and devices for their care. The office manager who is not making use of these facts loses time, energy, and money for his firm.

Today, managers of any kind of organization from the temporary, loosely constructed political campaign to the permanent corporation, lay out the aim and scope of the organization and immediately plan the records necessary to carry on their project. These records are the framework, in one sense, as long and as broad, but not as deep, as they always follow the lines laid out by the organization.

### The Central Filing System

In years past, these files and indexes were started in any part of the organization as a need developed without regard as to whether they were a duplication as a whole or in part of some other record, or whether they might be of any use to any department other than the one setting them up. But experience has proved this a wasteful method.

The tendency in modern business is to bring all files and indexes into one department and to place



the department in charge of a file clerk who is trained for such work and who is also a competent executive. Information is then furnished the various employes as needed by means of messenger service, house phones, or by lending materials to departments in much the same fashion that patrons borrow books from the public library.

The central filing system thus becomes a clearing house to which all papers are sent and from which all business papers are borrowed. Thus no question arises as to where any paper should go, or where to obtain information in such records, and there is less loss of both time and papers.

The file clerk in a central filing system has the opportunity to study the records as a whole, the indexes needed, to consider each part in relation to the whole, each file and index in relation to the complete service it can render to every department in the organization, and thus eliminate duplication, cut down cost in operating, and keep a unity in the method of handling the files and indexes which makes for accuracy and speed in the service rendered.

In almost every firm there are some files and indexes necessary to carrying on the work of departments and these must be kept in the respective departments. But many department heads would gladly relinquish the care of such material they are now keeping if they were sure they could get the papers or information they want when they want it. In many instances, the department does not need the correspondence or extended record it is keeping, but would be much better served if certain information were taken from such papers and placed on a well designed card which would be much more readily accessible. When duplicate records are needed, they will cost less if made at one time. The head file clerk in a central filing system with the necessary corps of workers should file away papers and make indexes for the various departments as well as for the central filing room.

An alert, competent file clerk can readily check letters to see that all points have been cared for before the letter is filed. The initials of each person attending to each point should be placed on the letter and the carbon copy of the answer pinned to the incoming letter. Because regulations covering the points just cited had not been made in one of our large city banks, three of its officials answered the inquiries of a small town banker in three different ways to their great discomfort. The central filing system which they installed to prevent the repetition of such mistakes has corrected even more inaccuracies and delays than they had counted on.

#### Economizing Space and Time

The filing department is set up primarily for service. Records should be well filed for historical purposes and should occupy the least space possible, for economic reasons; but by far the most important feature is to have them so arranged that they can yield the information wanted quickly and accurately. The rearrangement of information from letters and reports into statistical form on sheets and cards carefully designed for that purpose will

doubtless be done more in the future as it will save the time of the consultant, economize space and give added values over the cumbersome method of consulting one paper at a time.

Records which a short time ago were tucked off in attics and basements are now being brought into the well-ventilated and well-lighted rooms which are needed to carry on the detailed work of filing



Foreign orders numerically arranged, in cap size wood cabinets. Foreign division, Montgomery Ward & Co. (Globe-Wernicke equipment.)

large quantities of papers accurately and rapidly. It is still, however, an unstandardized line of clerical work and some office managers who would not hire a typist who is not well trained, turn over to inexperienced office boys the filing of valuable records and let their high-salaried men stand around wasting good hours and energy in denouncing the inadequate filing system, when a well trained file clerk with executive ability could arrange easily enough to give them the papers they want when they want them.

#### Importance of Files

The efficiency expert who has investigated this problem will tell you that the modern methods of filing cost more money for equipment, individual salaries for clerks are higher, and the quarters are more expensive, but that on the whole it is cheaper because it cuts overhead expense, it gives the firm the chance to do better business, often definitely bigger business, than did the old way of letting anyone file any of the papers at any time he had nothing else to do. Filing and indexing in one sense is one phase of efficiency work.

In the central filing department there is an excellent opportunity to study in detail the policy of the firm and the various departments in it, the business that comes in and the firm's methods of handling it. For this reason some organizations are requiring the new clerical workers to spend a certain length of time in the filing department and are teaching there the principles of filing and indexing and the various records kept in the organization.



# Oil Pipe Line Transmission

BY H. W. CROZIER

(The fuel situation has centered considerable added interest lately upon oil production and distribution, and in view of the especial interest which this subject has for the West, the following article is a timely contribution to current discussions. The author is associated with the engineering firm of Sanderson and Porter, San Francisco.—The Editor.)

Oil pipe-line design methods applicable to the heavy and refractory oils of California and Mexico as well as to the easily pumped oils of the Mid-continent and Eastern fields have been developed, starting from an initial effort to connect hot oil pumping performances with the well established formula for water of the hydraulic engineers. It was

certainly by selecting values of the exponents greater than 0.5 that the formula more nearly expresses hydraulic flow, and the value of  $c$  becomes nearly constant. Several of these exponential formulæ have been proposed, but the most useful one to the author is the Hazen and Williams formula, for which excellent tables have been published, calculated by means of a special and very valuable slide rule. The formula is written  $v = c r^{0.63} s^{0.54} 0.001^{-0.04}$ .

When fluids other than water are being considered having a viscosity other than one, it is necessary to take such factor into consideration in the hydraulic formula, introducing the square root of  $V$ , the viscosity as an additional factor. The more



Pumping station in California, handling heated oil. The relatively heavy oils of California and Mexico must be heated to permit practically any kind of pumping.

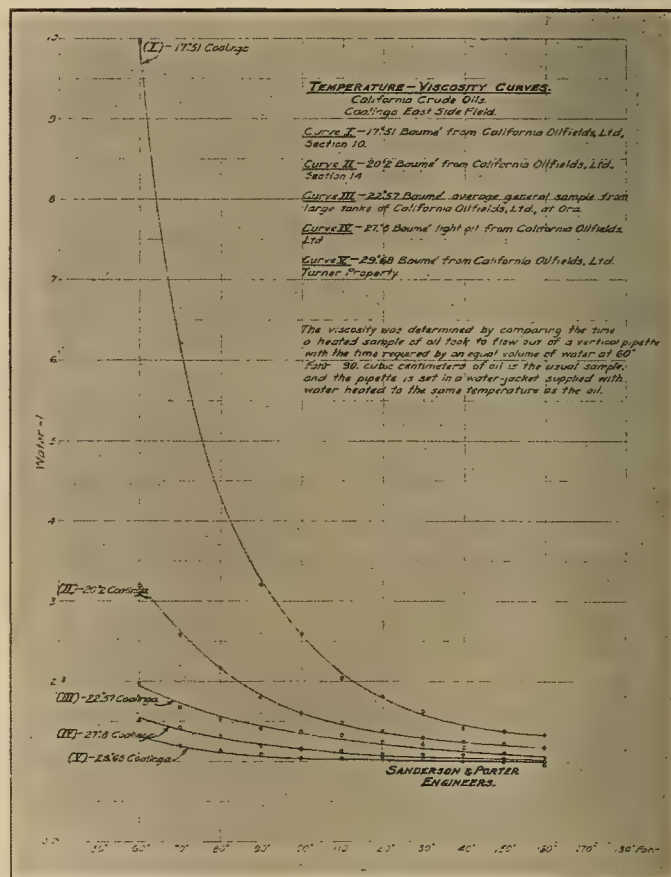
recognized if this could be accomplished there would thereby be opened to the oil engineer that vast store of hydraulic information so patiently and industriously accumulated by the hydraulic engineers during a century of effort.

Separating the general problem so that the factors of temperature, viscosity and hydraulic flow under varying temperature and viscosities could be attacked in detail, was greatly aided by clearly defining each individual step and determining methods for the construction of temperature viscosity curves of crude oils, derivation of logarithmic temperature decrement formula, and the conception of the novel idea of the curved hydraulic gradient, so that it is now permissible at least to outline the general solution of the oil flow problem applicable to any kind of heated oil.

Constants now determined permit calculations of oil pipe lines for long distance transportation as well as for use within the refinery or at the sea-loading stations, and as accurate results can be obtained as for any other engineering structure calculation.

## Hydraulic Formula

The well known Chezy formula for the flow of water is  $v = c\sqrt{rs}$ , or, when written in exponential form,  $v = c r^{1/2} s^{1/2}$ . The factor  $c$  is not constant, but varies with the slope, roughness and hydraulic radius. Kutter's formula was devised to determine the factor  $c$ . Modern hydraulic engineers have as-



Temperature-viscosity curves for a representative group of samples of oil from the Coalinga field of California.

accurate form, namely, the Hazen and Williams formula, is then written as follows:

$$v = \frac{C r^{0.63} s^{0.54} 0.001^{-0.04}}{\sqrt{V}}$$

No doubt a future more accurate determination will show the exponent for the viscosity factor is different from 0.5, but we at present content ourselves with this value until such determinations are made. It has been found that the formula in this form gives fairly accurate results when the value for  $C$  for water is taken at 138, which is the value for



smooth pipes of the diameters usually encountered in oil pipe line construction.

Table 1  
PIPE LINES

Case	Line	Gravity	C			
			√V	V	√V	C
I.	*Monterey 6" Line	26.°	129	1.23	1.11	143
II.	*Producers 8" Line	17.°7	95	2.60	1.61	153
III.	*Producers Half Capac.	18.°3	76	2.45	1.55	120
IV.	*Ora 4" Line	28.°0	97	1.60	1.26	124
V.	*Gen. Half Capac.	18.°	86	2.60	1.61	138
VI.	*Gen. Petr. 8" Line	20.°	100	1.85	1.36	136
VII.	Valley Line 8" & 10"	20.°	101	1.87	1.37	138
VIII.	Yarhola 6" Line	31.°	120	1.35	1.16	136
IX.	Yarhola 10" Line	37.°	125	1.28	1.12	140

Table 1 is based on data of various degrees of reliability and is included partly as a record of progress. The pipe lines marked with a star were operating lines of which some test data was obtainable, unfortunately incomplete in that samples were not available. The calculations to determine the value of C were based on temperature viscosity curves of available oil samples of somewhat similar characteristics. These samples were from the same fields, but no doubt, if true samples could have been had the agreement in the value of C would be better.

Items I to VI of Table 1 were used for the purpose of originally deriving the value of the constant C. The items VII, VIII and IX are constructed lines, which were designed by use of the formulæ just described. The values of C were determined either during the acceptance tests or immediately thereafter. Their close accordance with the original value selected is remarkable.

A consideration of the methods of determining the quantity V, representing viscosity, and particularly in the general case of pipe lines where the oil, initially heated, cools rapidly as it flows along, follows.

Temperature-Viscosity Curves

The relatively heavy oils of California and Mexico must be heated to permit practically any kind of pumping and therefore, if the discharge line is of any considerable length, there is a gradual cooling of the oil due to the loss of heat by radiation and conduction, resulting in a condition wherein the vis-

cosity gradually increases as the oil flows through the pipe. The curves shown in the illustration give a very good idea of what takes place.

On account of the difficulty in handling the viscosimeters of the standard types with varying temperatures, a glass pipette has been used, having a relatively long outlet tube and enclosed in a water jacket, in which water of the correct temperature is circulated. With this apparatus, quite accurate and concordant results are obtainable, if care is taken in the manipulation. Usually a run of the oil sample at temperatures increasing by 10° Fahr. increments, gives sufficient points to permit drawing a satisfactory and smooth curve. Water is run at 60° Fahr. for comparison. The results in seconds are corrected for gravity of the oil and the corrected seconds divided by the seconds for water, resulting in a figure called V and representing the viscosity in terms of water.

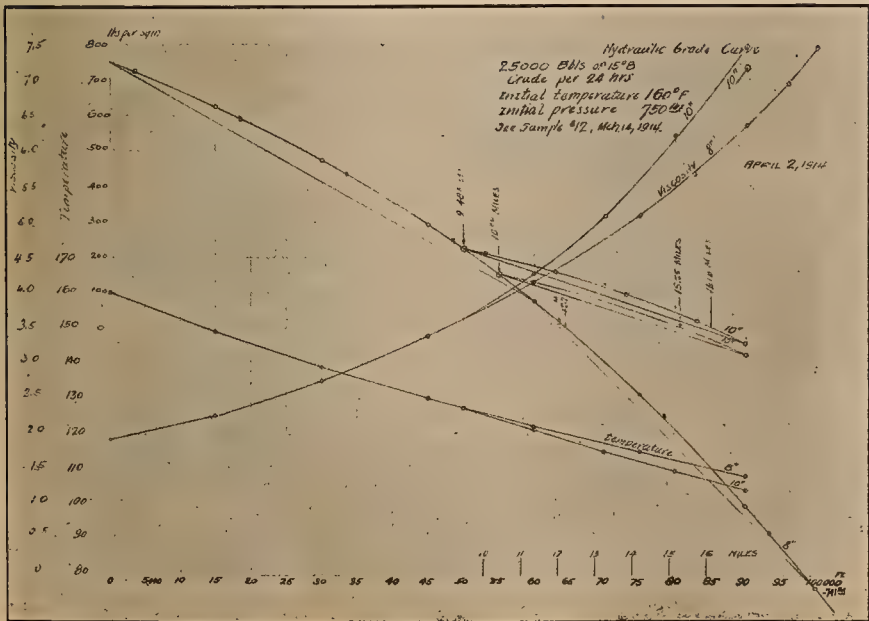
Curved Hydraulic Gradient

When considering a pipe line handling water, hydraulic engineers have been accustomed to draw a straight line, called the hydraulic grade between the source and discharge point, to represent, at any point, by its distance from the base line of zero pressure, the pressure at such point.

This line with a pipe of uniform bore is straight. In considering heated oil, a new conception, namely, a curved hydraulic grade line, is introduced, curved because the pressure does not drop proportionately to the distance but at an accelerating rate, because of the cooling of the oil as it flows away from the source.

Temperature Decrement Curve

Assuming a knowledge of the temperature-viscosity characteristics of the oil to be pumped, it will be readily seen that something must be known about the temperature at various intermediate points along a pipe line where the oil is heated initially to some temperature considerably above the earth, such as, for instance, 100° to 140° Fahr. The temperature will drop rapidly at first, near the pumping station,



Viscosity curve indicating viscosity mile by mile as oil leaves pumps, and hydraulic grade curve constructed on basis of viscosity curve, used in designing a pipe line. Two trial designs are shown, using different junction points and different proportions of 8-in. and 10-in. The temperature drops relatively faster after passing the 10-in. junction, due to the increased surface.



and less and less rapidly as the temperature difference between the oil and the earth decreases.

A curve representing such temperature relations can be drawn, which from its equation will be recognized as a logarithmic decrement curve. It is:

Where

$$L = 8.8 \frac{a B W S}{d} \text{Log } t$$

$d$  = diameter of pipe in inches

$B$  = barrels per hour

$W$  = weight 1 barrel in pounds

$L$  = length of pipe in feet

$a$  = radiation constant

$t$  = difference in temperature between earth and pipe

The equation is derived as follows:

$S$  = specific heat of oil taken at 0.5

$q$  = B.t.u.'s lost per hour from 1 sq. ft.

Some values for the radiation constant  $a$ , calculated from test reports of California pipe lines, are as follows:

8" line, full capac. Dec. 12-16, 1910.....26,128 bbls. daily 20°B  $a = 1.67$   
8" line, full capac. Nov. 15, 1910.....24,494 bbls. daily 17.7°  $a = 1.75$

The total heat lost from a short section of pipe is:

$$Q = B W S \frac{(T'_b - T'_e)}{a} \text{ in B.t.u.'s per hour,}$$

when  $T'_b - T'_e$  are the temperatures at the beginning and the end of the section under consideration.

$$(T' - T)$$

The rate of loss  $q = \frac{(T' - T)}{a}$  in B.t.u.'s per hour

from each square foot where  $T$  is the earth temperature and  $a$  the radiation constant. This is a potential equation similar to the electrical equation

$C = \frac{E}{R}$ , but because the resistance decreases as we pass from the pipe due to increasing diameter, this equation may be of higher than the 1st power.

The heat lost at any point is:

$$dQ = q \frac{\pi d}{12} dl$$

$$(T' - T)$$

where  $q = \frac{(T' - T)}{a}$ ,  $T'$  being the temperature at  $dl$

and  $T$  the earth temperature.

The temperature lost in passing  $dl$  is:

$$dt = \frac{dQ}{BWS}$$

because—

$$\left. \begin{aligned} T'_b &= \frac{H}{BWS} \\ T'_e &= \frac{H - dQ}{BWS} \end{aligned} \right\} \text{for distance } dl.$$

$$T'_b - T'_e = \frac{H}{BWS} - \frac{H - dQ}{BWS} = \frac{dQ}{BWS}, \quad T'_b - T'_e = dt.$$

but

$$dQ = q \frac{\pi d}{12} dl$$

therefore

$$dt = \frac{q \pi d}{12} \frac{dl}{BWS}$$

transpose and substitute for  $q$ .

$$\text{then } dl = \frac{12 BWS}{d} \frac{dt}{(T' - T) a}$$

$$= \frac{12 BWS a}{\pi d} \frac{dt}{t}$$

$$1 = \frac{12 BWS a}{d} \int_b^e \frac{dt}{t}$$

$$1 = 8.8 \frac{a BWS}{d} \log t + c$$

Referring now to the illustration showing the set of curves used in designing a California pipe line, we have as the first step in the design the temperature decrement curve, which indicates the temperature at any point when the line is carrying its full capacity of heavy oil. Necessarily our design must start here because, having heated oil to the highest advisable temperature, we must know what temperature will be reached by the time the oil is delivered at the next pumping station and all the intermediate temperatures.

Assuming oil samples have been run and the temperature-viscosity curves determined for the various oils the line may be called on to handle, we can, knowing the temperature at any point from the temperature decrement curve, construct a curve of viscosity which indicates the viscosity mile by mile as the oil leaves the pumps. Similarly, from the hydraulic flow equation, a hydraulic grade curve is constructed on the basis of the viscosity curve so drawn. Where the hydraulic grade curve intersects the base line, obviously the next pumping station should be located, if the elevations are equal. Actually this seldom happens as the elevations differ, so we draw a hydraulic grade curve such as shown to the scale of the pipe line profile and use it to determine the location of the pumping stations. When the pipe ascends grades, the stations will be nearer together, and when it descends, further.

Now, in the chart here reproduced, a considerable proportion of ten-inch pipe was used and two trial designs are shown in the curves, using different junction points and different proportions of 8-in. and 10-in. It will be noted that the temperature drops relatively faster after passing the 10-in. junction, due to the increased surface, and is clearly shown on the temperature decrement curve. Sympathetically the viscosity increases more rapidly following the temperature drop. The hydraulic-grade, however, because of the greater area of the 10-in. pipe as compared to 8-in. pipe, has less slope and intersects the base line several miles farther along, where the next pumping station would be located.



These three curves—the temperature decrement curve, the viscosity distance curve, and the hydraulic grade curve—assembled on one sheet, show the complete design of the pipe line.

The preceding applies to heated oils flowing through pipes and gradually cooling. In some cases in California, and quite generally in the Eastern and Mid-continent fields, the oil is sufficiently limpid

at ordinary temperatures to make heating unnecessary, and therefore, the hydraulic grade is calculated directly from the temperature viscosity curve, taking the viscosity at such temperature point as the engineer's judgment indicates would be the most suitable, giving due consideration to winter conditions, summer heat, etc. In such a case the hydraulic grade is a straight line and the problem is much simplified.

## The New Physics

BY A. C. CREHORE

(The numerical expression of values which have hitherto been only relative is one of the important contributions of the new system of physics presented in these articles. The author here follows out some of the mathematical aspects of the theory that the dimensions of mass are those of a velocity.—The Editor.)

In this section we shall briefly give the reasons that have led to the belief that the dimensions of mass are those of a velocity. There are two equally forceful reasons why we have come to these dimensions for mass. The first is that a new expression has been found for Planck's constant,  $h$ , which demands that the dimensions of mass shall be those of a velocity, and the second reason is that the gravitational equation, which the author has developed, makes the same demand.<sup>1</sup> Thus far the constant,  $h$ , has made no appearance in the preceding expressions involving the constants,  $m_H$ ,  $m_e$ ,  $e$ ,  $K$ ,  $c$  and  $k$ , and it seems required to explain what is meant by this constant.

### Ratio Between Light-Frequency and Energy

When energy is radiated by a gas, the amount of the radiated energy has been shown to be proportional to the frequency of vibration at which the radiation takes place. Or again, if light of a definite fixed frequency is allowed to fall upon a fresh metallic surface in vacuo, electrons are observed to be emitted from the surface, and the energy of each electron as it comes away from the surface has been found to be strictly proportional to the frequency of the light, and to depend upon nothing else. This relation was pointed out by Einstein, who proposed the very general formula, energy is proportional to frequency, and is equal to a constant,  $h$ , times this frequency. The ratio between the energy and the frequency is this constant quantity known as Planck's constant,  $h$ . Millikan has put this formula of Einstein to an experimental test, and has obtained surprisingly good results from his machine-shop-in-vacuo apparatus. A piece of metallic sodium is so held in a vacuum tube that a knife operated by a magnetic device outside of the tube can cut a thin chip off from the metal without destroying the vacuum in so doing. Moved into another position inside of the tube, light is allowed to fall upon the surface immediately while it is fresh, which causes electrons to be ejected from the metal. The velocity at which these electrons are ejected from the metallic surface was measured by means of an opposing voltage, and these voltages are proportional to the energy of the electrons, because energy is equal to the product of electromotive force and electrical

charge, and the charge on the electron being constant the energy is proportional to the electromotive force. By employing light of definite known frequencies throughout a long range of wave-lengths, and by measuring the corresponding voltage for each frequency of the light, sufficient data was obtained for plotting a good curve. If the Einstein equation represents a truth, the curve thus obtained by plotting the frequencies as abscissae and the voltages as ordinates ought to be a straight line. All the points obtained by Millikan in this experiment do lie remarkably near to the best straight line drawn by the method of least squares, and this throughout the whole of the range. This experimentally confirms the Einstein equation with considerable precision.

### A New Equation

Now the slope of this line can be measured with considerable accuracy, too, the tangent of the angle representing volts divided by frequency, which is proportional to energy divided by frequency, but energy divided by frequency is Planck's constant,  $h$ . So a measurement of the tangent of the angle that this line makes gives a numerical value of  $h$ , assuming that the charge on the electron,  $e$ , is known. The best result of all of this work gave the numerical value for  $h$ , according to Millikan's statement in his book "The Electron,"

$$h = 6.56 \times 10^{-27}.$$

The new theoretical expression that the author has found for Planck's constant above referred to is

$$h = \left( \frac{a_H}{3} \right)^4 \frac{(2K)^3}{c},$$

the letters denoting the same quantities as they did above. The reason for believing that this is the correct expression for  $h$  is that both the dimensions of it and the numerical value are correct. Let us first consider the dimensions. The dimensions of  $a^4$  are  $L^4$ , of  $K^3$ ,  $T^{-3}$ , and of  $1/c$ ,  $L^{-1}T$ . All together they become

$$h = L^3 T^{-2},$$

which are seen to be the dimensions of  $h$  on the space-time system according to Table I. This expression introduces no doubt as to its dimensions because neither of the quantities  $k$  nor  $m$  are involved in it, and there is no doubt as to the dimensions of  $a$ ,  $K$  and  $c$ .

<sup>1</sup>A. C. Crehore, Physical Review, Vol. IX, No. 6, Sec. Series, June, 1917, equation (77), page 464.



According to the Einstein equation, which has been experimentally established, the constant,  $h$ , is equal to energy divided by a frequency, that is multiplied by a time. Energy has the dimensions of  $mv^2$ , mass times the square of a velocity on the common system of units, that is  $L^2 M T^{-2}$ , and this multiplied by a time gives the dimensions of  $h$ ,

$$h = L^2 M T^{-1},$$

on the common system of units. This is of the nature of one of the mechanical units like force, energy, momentum, etc., in that it does not involve either  $k$  or  $\mu$ . It has the exact nature of the quantity, moment of momentum, namely  $mva$ , the dimensions of which are evidently  $L^2 M T^{-1}$ .

If it is now assumed that the dimensions of  $h$  obtained above on the space-time system are exactly the same as the dimensions just given on the common system, we must have

$$h = L^3 T^{-2} = L^2 M T^{-1},$$

whence it immediately follows that the dimensions of  $M$  must be

$$M = L T^{-1}, \text{ a velocity.}$$

This is one of the reasons for considering that mass has the dimensions of a velocity. But before calculating the numerical value of  $h$ , let us examine the new expression from other points of view. The  $2K$ , which appears in the expression, is equal to the frequency of revolution of the electrons in the hydrogen atom in its normal state, which accounts for the numeric, 2, satisfactorily. The only other numeric in the expression is the  $1/3$ rd part of the radius of the nucleus. In connection with a spherical shape the factor  $1/3$ rd of the radius occurs in the expression for the volume of a sphere.

#### Determining the Value of a Constant

An expression has been given above for the radius of the nucleus in terms of the Rydberg constant and specific inductive capacity, namely

$$a_H = 8/5Kk.$$

Using this expression for  $a_H$  in the new value of  $h$  above, we obtain as an equivalent expression for  $h$ , by eliminating  $a_H$ ,

$$h = 8^5/15^4 k^4 Kc.$$

The dimensions of this expression are just the same, namely,  $L^3 T^{-2}$ , if we regard  $k$  as the reciprocal of a velocity. But, the numerical value of  $k$  is unity, and the constant,  $h$ , is thus made to depend numerically upon the two constants  $K$  and  $c$  alone, each of which is known with exceptional accuracy. Adopting the values as before, namely  $c = 3 \times 10^{10}$ , and  $K = 3.290 \times 10^{15}$ , we find

$$1/Kc = 1/3.290 \times 10^{15} \times 3 \times 10^{10} = 10.13171 \times 10^{-27}$$

and the numeric

$$8^5/15^4 = 32768/50625 = 0.647,269.$$

Multiplying these together gives  $h$  numerically as

$$h = 6.5579 \times 10^{-27}.$$

Upon comparing this value with the experimental value obtained by Millikan, as above described, namely,  $6.56 \times 10^{-27}$ , it is seen that the agreement is almost exact; and especially, if we should make  $c$  just a little under  $3 \times 10^{10}$ , which has not been done because there seems to be a difference of opinion as

to the best value of the velocity of light among the different authorities, though all agree in making it under 3, we would obtain a yet closer value to 6.56. It is thus of considerable importance to make the numerical value of  $h$  depend upon only two constants that are so accurately determined as  $c$  and  $K$ . No doubt from this circumstance a more reliable value of  $h$  can be obtained than by any other method.

In examining the work of Millikan it is found that he has given some weight to the experimental value of  $h$  found by different methods by other experimenters, and has struck an average between them, finally adopting as a value that seems to fit all results the best of  $h = 6.547 \times 10^{-27}$ . Such a difference as that between 6.56 and 6.547 would make an easily perceptible difference in the slope of the line that Millikan found as the best result of his experiment. It is the author's opinion that there was no increase in the accuracy of the value of  $h$  obtained by abandoning the true result of his own experiment because of the influence of the other experimental results.

The expression for  $h$  may be transformed again by means of the Lorentz mass formula, namely

$$a_H = \frac{16}{5m_H k} \left( \frac{e}{c} \right)^2$$

and the Rydberg constant

$$2K = m_H \left( \frac{c}{e} \right)^2$$

into the following form, in which  $K$  is eliminated,

$$h = \left( \frac{16}{15k} \right)^4 \frac{e^2}{m_H c^3}.$$

This form is of interest as connecting  $h$  with  $e$  and  $m_H$ . It is to be observed that the dimensions of the denominator are zero if we regard  $k$  as the reciprocal of a velocity and mass as a velocity, for  $mc^3$  is the fourth power of a velocity and  $k^4$  is its reciprocal. It follows that the dimensions of  $h$  are the same as those of  $e^2$ , and this is seen to be true according to the space-time table. There is, therefore, an intimate dependence of  $h$  upon  $e$ , and the fact that  $e$  is a constant charge would indicate that  $h$  must also be constant.

#### New Units of Length and Time

It seems as if the importance of these new thoughts can best be emphasized if we examine the case by supposing that our units of length and of time undergo a change and remain no longer the centimeter and the second. And, especially, the importance of retaining the  $k$  in all equations is well brought out. The second of time is not a natural unit as pertaining to the atoms. It depends rather upon the rotation of the earth on its axis. A more natural unit for time would be the time of one revolution of the electrons in the hydrogen atom. And the centimeter is not a suitable length, or rather a natural one, as applied to the atoms. A natural unit of length would be the distance travelled by light during the time that the electrons in hydrogen are making one revolution. Let us for purposes of



illustration adopt these two units in place of the centimeter and the second.

The velocity of light then becomes unity instead of  $3 \times 10^{10}$  because light travels one unit of distance in one unit of time. Any velocity on the new system of units may then be obtained from the old units by dividing the numerical value of the old velocity by  $3 \times 10^{10}$ .

To convert length from one system to the other use may be made of the following:

A new unit of length  $= 3 \times 10^{10} / 2K = 4.559,25 \times 10^{-6}$  cm.

One centimeter (old)  $= 2.1933 \times 10^5$  new units.

A new unit of time  $= 1/2K = 0.151,975 \times 10^{-13}$  seconds.

One second (old)  $= 2K = 6.58 \times 10^{15}$  new units.

To obtain the new values of other quantities, involving powers of L and T or both in the dimensional formulæ, multiply each L by  $2K/3 \times 10^{10} = 2.1933 \times 10^5$ , and each T by  $2K = 6.58 \times 10^{15}$ .

For example, twice the Rydberg constant becomes unity on the new system, for

$$2K = 6.58 \times 10^{15} = T^{-1}$$

on the old system becomes

$$2K = 6.58 \times 10^{15} / 2K =$$

unity on the new system.

Specific inductive capacity is numerically unity on the old system, but, being the reciprocal of a velocity, the old value must be multiplied by  $3 \times 10^{10}$ , and this is, therefore, the value of specific inductive capacity on the new system. It is quite evident from this result that it will never do to omit to express specific inductive capacity in writing any formula.

#### New Unit of Mass

Since mass has the dimensions of a velocity, the new unit of mass becomes  $3 \times 10^{10}$  grams, and represents a volume of water filling a cube some 31.07 meters on each edge. It is thus a very large unit for mass. The mass of the hydrogen atom expressed in the new units must, therefore, be a smaller number than it was on the old system by the factor  $3 \times 10^{10}$ . It was formerly  $1.658 \times 10^{-24}$ , and on the new system becomes

$$m_H = 1.658 \times 10^{-24} / 3 \times 10^{10} = 0.55267 \times 10^{-34},$$

and

$$m_n = 0.898 \times 10^{-27} / 3 \times 10^{10} = 0.29933 \times 10^{-37}.$$

The expression above given for the Rydberg constant may be written

$$2Ke^2 = m_H c^2,$$

but, now, on the new system of units,  $2K = 1$ , and  $c = 1$ , hence numerically

$$e^2 = m_H = 0.55267 \times 10^{-34},$$

but this is not a dimensionally true relation. The K and the c must be expressed. The omission of them is exactly analogous to the omission of the k in the common system of units, and this example thus emphasizes the importance of the matter. The new value of e is the square root of the above, namely

$$e = 0.743 \times 10^{-17}.$$

If we examine the equation just given for the Rydberg constant, it is seen that  $2Ke^2$  has the dimensions  $L^3 T^{-3}$ , and so also does  $m_H c^2$  have the same dimensions, and these dimensions are those of energy, the cube of a velocity on the space-time sys-

tem. Numerically, therefore, since  $c = 1$ , and  $2K = 1$ , this energy has the same value as the mass of the hydrogen nucleus and also of the square of the charge on one electron. If we had always used this new system of units instead of the old system, and had omitted the c and K, one might be led to believe that the mass of the nucleus is just the same as its energy content, for we may regard this energy as the internal energy content of the nucleus. We know, however, that mass is a quantity of a different kind from energy, and the use of the common system of units has never suggested that they are the same thing.

On the new system of units Planck's constant takes the very simple numerical value

$$h = \left( \frac{16}{15k} \right)^4,$$

and depends only upon the specific inductive capacity, because of the relation above, namely

$$h = \left( \frac{16}{15k} \right)^4 \frac{e^2}{m_H c^3},$$

for the second factor becomes unity because  $c = 1$ , and  $e^2 = m_H$  numerically. Since  $k = 3 \times 10^{10}$  on the new system of units, the numerical value of h becomes

$$h = \left( \frac{16}{15 \times 3 \times 10^{10}} \right)^4 = (0.355,55)^4 \times 10^{-40} = 1.598 \times 10^{-42}.$$

From this it appears that an accurate determination of the velocity of light alone will give a reliable value of h in the new system of units. But, to convert this over into the present C.G.S. system will also require a good value of Rydberg's constant. This is, in other words, the same result as obtained before, and makes h depend only upon K and c.

#### Unit of Energy

This section will be concluded with some reflections upon the unit of energy and the actual amount of energy contained in one gram of hydrogen. Energy, being the cube of a velocity, the new unit of energy is  $c^3$  times one erg, or  $27 \times 10^{30}$  ergs, a very large unit.

Using the common system of units, the energy represented by  $m_H c^2 = 1.658 \times 10^{-24} \times 9 \times 10^{20} = 14.922 \times 10^{-4}$  ergs. This is equivalent to  $1.4922 \times 10^{-10}$  joules, since one joule equals  $10^7$  ergs, and this again is equal to the number of watts times the number of seconds, assuming that this energy can be extracted from the nucleus at some fixed rate. The total number of nuclei in one gram of hydrogen is equal to the Avogadro constant,  $6.062 \times 10^{23}$ , and the total energy in one gram is then  $6.062 \times 10^{23} \times 1.4922 \times 10^{-10} = 9.0457 \times 10^{13}$  joules. Let us imagine that this energy may be extracted by some means at the rate of 1000 watts, or one kilowatt continuously. The supply of energy in the one gram will then last for

$$6.062 \times 10^{23} \times 1.4922 \times 10^{-10} / 10^3 = 9.0457 \times 10^{10}$$

seconds of time.

This is equivalent to about 2870. years' time. The enormous store of energy in the single gram of hydrogen is thus more forcibly impressed upon us when expressed in the familiar practical system of units.



## General Lighting Safety Orders

(Among the most important legislative developments in California of recent months are the general lighting safety orders issued by the State Industrial Accident Commission. As they affect every branch of the electrical industry as well as all other industries, throughout the State, their provisions have been summarized in the following review, especially compiled for the Journal of Electricity.—The Editor.)

On December 1, 1919, the General Lighting Safety Orders, issued by the Industrial Accident Commission of California under the powers granted them by the Workmen's Compensation, Insurance and Safety Act, became effective. They are mandatory and affect all places within the State where people are employed for hire. They prescribe the minimum quantity of light, either natural or artificial, which must be supplied in all enclosures, yards or passage-ways used by employees. They place restrictions as to glare and light distribution upon the

result in a gradual but permanent injury to the eyesight of the workers. This less obvious result of improper lighting is even more insidious because it may be years before the individual becomes aware of the impairment of his vision which permanently reduces his effectiveness as a producer, and hence reduces his earning power to himself and his value as a producing unit to the State. Emergency lighting provisions have been included to guard against the possibility of insufficient light in passageways, stairways and exits to enable employees to avoid moving machinery, or vacate the building safely in the case of accident to the regular lighting system. Experience in New York, New Jersey, Pennsylvania and Wisconsin where similar lighting safety codes or orders have been in effect for some time, proves that these regulations do prevent accidents and conserve eyesight.

### Increasing Production

As the orders require only the bare minimum of intensities and restrictions as to glare and distribution of light to protect the workers to a reasonable extent, and a much greater amount of light is necessary to insure maximum production, it is unlikely that they will work a hardship upon building owners and employers. In other states where they have been effective, they have had the incidental economic value of raising the general standard of illumination and thereby increasing production. Factory managers who have installed improved lighting are unanimous in their conviction that adequate lighting decreases spoilage and increases production. Extensive investigations made in a large number of industries in the City of Chicago to determine the relation between lighting and production proved that good lighting increases output on an average of 15 per cent at an added cost of but 1 to 6 per cent of merely the labor cost. In one plant, a carburetor assembly department showed an average increase in production of 12 per cent with an increased cost for lighting of but .9 of 1% of the payroll.

Like other safety orders issued by the Commission, these orders place the responsibility of compliance upon the employers. It is, therefore, necessary for them to become familiar with the mandatory provisions or delegate this responsibility to some reliable source of advice. Architects, consulting engineers, lighting equipment manufacturers, distributors and contractors must thoroughly familiarize themselves with the orders if they are to be in a position to fulfill their duty to their clients and customers. Insurance companies should be interested as these orders affect their employers liability insurance, because insured plants whose lighting does not comply with the lighting provisions and restrictions may be considered to show negligence which may affect the rate of accident compensation.



Adequate and careful lighting for construction work, whether indoors or out of doors, has been found not only to reduce accidents but to speed up the work.

means of obtaining these required minimum quantities for described conditions, and they provide for emergency lighting where the nature of the hazard indicates that it is necessary. They have been published in convenient pamphlet form and are ready for distribution. Copies may be obtained by application to the Industrial Accident Commission.

### Prevention of Accidents

The prime purpose of the orders is to safeguard the life, limb and eyesight of employees. Numerous competent investigators have found by analysis of accident statistics that improper and insufficient illumination is the cause of a surprisingly large portion of our industrial accidents. Some authorities estimate this percentage at as low as 18 per cent., others at as high as 25 per cent. Our annual industrial accidents, fatal, serious and slight, total the surprising sum of over a million and a half. On the basis of the above percentages, accidents preventable by adequate lighting approximate annually the total American casualties in the great war. Further, it has been found that dim illumination, bright light sources in the range of vision, glare from polished surfaces, sharp shadows and flickering lights



The pamphlet containing the General Lighting Safety Orders is divided into two parts; first, the Orders Nos. 1500 to 1509 inclusive; and second, the Appendix. The Orders command. The Appendix recommends and explains. In the Appendix will be found much information gathered from reliable sources on the value of illumination as a means of increasing production and many helpful suggestions on how to comply with the orders. Besides containing lawful orders which must be complied with, it is a valuable manual on illumination to any plant manager.

### Digest of Orders

The orders were made as brief and concise as possible. The following digest may be helpful to those who must become familiar with them:

#### Order 1500. Definitions

Order 1500 contains only definitions of the terms used in the remaining orders.

#### Order 1501. General Requirements

Whenever the natural lighting in working or traversed spaces in buildings or grounds or, in fact, any places of employment fall below twice the minimum intensities of artificial light as specified in Order 1503, artificial light shall be supplied during the time such places are used.

#### Order 1502. Natural Lighting

Order 1502 deals with natural light—its character and quantity. It provides that when natural light is used, twice the intensity given in Rule 1503, which covers artificial lighting requirements, must be provided. It requires that awnings, shades or diffusive or refractive window glass must be provided where the worker must face excessively bright light. For instance, if a worker is forced to face a southern exposure window, an awning, shade or some other means of diffusing or cutting off the very strong light, must be provided. This is to protect the eyes of the employed from glaring daylight, either direct sunlight or extremely bright reflected light from clouds in the sky or white buildings adjacent.

#### Order 1503. Artificial Light

This order specifies the quantity of artificial light which must be provided when daylight or natural light falls below twice the values specified. These intensities are given in foot-candles the unit of intensity of light, and vary with the nature of the work carried on in the different spaces. They are the absolute minimum required to insure reasonable safety from accident and injurious eye-strain, and are to be measured at the floor level in the case of roadways, passageways, stairways, elevators, etc., and in the case of working areas, where the work is actually performed. They range from a minimum of .02 foot-candles required for roadways and yard thoroughfares to a maximum of 5 foot-candles for special cases of fine work, such as watchmaking, engraving, drafting, etc. In the case of roadways, it is considered that .02 of a foot-candle is sufficient to enable the workmen to go about their usual work without danger of falling over or colliding with objects. The requirements of 5 foot-candles for particularly fine work was made primarily to prevent injurious eye-strain which would be caused by looking at fine details with insufficient illumination.

These orders also recognize the fact that certain operations can best be performed in comparative darkness or by their own light, such as certain photographic processes and certain kinds of glass working. In such cases, the minimum intensities required elsewhere do not need to be supplied but it is necessary in that case to take special precautions to properly safeguard the workman.

#### Order 1504. Measurements

This order provides that all measurements shall be made with a standardized photometer, certified by the Industrial Accident Commission, and that such measurements shall be made at the locations specified in the table given in 1503.

#### Orders 1505, 1506 and 1507

These three orders have to do with the shading of lamps

for local and overhead lighting for the purpose of preventing glare which produces eye-strain and increases the accident hazard, and also affects the distribution of light on the work. They are, perhaps, the most important and yet the easiest to be complied with. Order 1506 requires that all lamps used for local lighting, when at or near the eye level, even a small 10 watt Mazda, must be shaded in such a manner that no part of the filament shall be visible to the employees. This simply means that all light sources, at or below the level of the eyes, shall be shaded.

Order 1505 specifies that all lamps suspended above the eye level less than one-quarter their distance from any position at which work is performed, or where places are traversed, must be shaded or covered up with a diffusing medium so that the intensity of the brightest one-quarter square inch of visible light source shall not exceed 75 candle-power per square inch. To put this in another way, it means that the filament of Mazda C lamps shall not be visible to the eye of the worker if it is hung lower than one-quarter of the horizontal distance between that worker's eye and the light source. More concretely still, it means that if a clear Mazda C lamp is hung 10 feet from a worker and lower than 2½ feet above his eye level, it must be shaded by a reflector or the bulb must be covered so as to diffuse the light. Bowl frosting in the case of the smaller sizes of Mazda C lamps will sufficiently diffuse the light as to comply with this provision. However, special glass diffusing caps which are now available and which have been developed for the purpose diffuse the light more thoroughly.

A new enameled frosting has been developed by lamp manufacturers for the purpose of enabling lamp users to comply with this order and also to decrease glare generally in industrial lighting. For the larger Mazda C lamps the glass diffusing caps, enclosing glass globes and enameled frosting is much preferable.

Lamps suspended at elevations greater than 20 feet above the floor are not subject to this requirement. However, in most cases the consideration of efficiency makes it advisable to use reflectors even when lights are suspended above 20 feet above the floor.

This order also points out the necessity of carefully designing the lighting installation where workers are required to work on polished surfaces such as polished metal, celluloid, varnished wood, etc., where the reflection of the light source may be sufficient to produce eye-strain.

#### Order 1508. Emergency Lighting

Order 1508 is one of the most important, yet perhaps the most difficult to interpret clearly. Note 1 under paragraph (a) gives the purpose of this order and reads as follows:

"Note 1.—It is the intention of this Order to guard against accident due to the failure of the regular lighting system, by providing sufficient illumination to enable the occupants to:

"(a) Avoid contact with moving machinery and other danger points until the regular lighting is again placed in operation.

"(b) To vacate the building safely and expeditiously when this is necessary because of fire or other causes."

This order provides that emergency light shall be provided in all work space aisles, stairways, passageways, exits, outside landings of fire escapes and other structures used as regular emergency means of egress. These emergency lights are to provide for adequate illumination when through acci-



dent or other causes the regular lighting is extinguished. They shall not comprise more than 50 per cent of the total artificial illumination, and shall have a minimum intensity of ( $\frac{1}{4}$ ) foot-candle.

The emergency lighting system shall burn at all times when artificial light is required or when daylight falls below twice the minimum intensities specified in the table in Order 1503.

This order also contains provisions with reference to the reliability of the source of supply for the emergency lighting and restrictions as to arrangements of the wiring. Because the nature of the hazard varies so widely with the many different conditions as to number of employees and location of the work rooms it was practically impossible to specify clearly exact requirements. Consequently considerable has been left to the discretion of the Commission. Any questions arising in the minds of those who will be affected should be placed before the Commission.

#### Order 1509. Switching and Control Apparatus

The purpose of this order is given in the note which appears in the printed pamphlet and which reads as follows:

"The purpose of this Order is to make it possible for the night watchman or other qualified persons to turn on enough lamps, when entering any por-

tion of the premises at night, to enable them to safely see their way around without the need of a lantern or flashlight."

The pilot or night lights may be a part of the emergency lighting system. The switches controlling the pilot or night lights may be located or controlled from the main entrance and other easily accessible points.

Emergency lighting and pilot or night light switches must be plainly labeled for identification.

Small light measuring instruments or foot candle meters suitable for measuring the illumination required by these orders may be obtained at a nominal price from the large Mazda lamp and some of the reflector manufacturers. These foot-candle meters are compact, simple and easily read by the ordinary person with very little practice. Plant managers, architects, consulting engineers, lighting equipment distributors and contractors as well as factory inspectors will find them not only a convenient tool to be used in connection with the application of these orders, but a valuable means of checking up adequate illumination for maximum production. Hundreds of these instruments have been used throughout the country during the past few years.

## Essentials of Esperanto

BY W. R. DAINGERFIELD

(The simplicity of the rules of Esperanto make its promoters confident of its practicability as a common commercial language. Following is a continuation of the grammar compiled by Judge Daingerfield, one of the foremost Esperanto authorities on the Pacific Coast. Further material will appear in future issues of the Journal of Electricity.—The Editor.)

17. La prepozicioj en Esperanto estas pli precizaj kaj logikaj ol en en naciaj lingvoj. Se la prepozicia senco estas duba, oni povas uzi la nedifinan prepozicion **je**, aŭ forigi la prepozicion, kaj en tiu ĉi okazo lasta oni montras la forigon, akuzativigante la komplementon de la forigita prepozicio. Se apudiĝas alia akuzativaĵo, tiam oni uzu la prepozicion **je**, evitante malklarsencon. Ekzemple, "Le venis en la pasinta dimanĉo, aŭ je la pasinta dimanĉo, aŭ simple, la pasintan dimanĉon."

18. La prepozicioj **al** (towards), **ĝis** (as far as, up to, until) kaj **tra** (through) montras mem almovon, kaj do ne postulas la akuzativon de direkto. Se oni derivigas adverbon por montri direkton, la adverbulo prenas **-n**; jene, el la vorto **hejmo** derivigas la adverbulo **hejmen**. La akuzativo de direkto estas kelkafoje figura; kiel, "Li disŝiris la leteron en pecetojn," "He tore the letter into small pieces."

19. Resume: Estas tri specoj de akuzativoj, jene: 1. Komplemento de transitiva verbo; 2. Akuzativo de direkto; 3. Akuzativo montranta forigon de je aŭ de alia prepozicio.

20. La sola helpverbo estas **esti** (to be). **Havi** (to have) signifigas tenon, posedon aŭ regadon, kiel en la angla, sed oni ne uzas la verbon **havi** por fari verbtempaĵojn.

21. La elparolado de la esperantaj frazoj kaj esprimoj en la antaŭirintaj dudek numeritaj alineoj estas vidigebla jene:

"Balai" estas "bah-lah-ee." En Esperanto ĉiu vokalo aŭ diftongo konsistigas unu apartan silabon.

17. Prepositions in Esperanto are more exact and logical than in national languages. When the prepositional sense is doubtful the indefinite preposition **je** may be used, or the preposition may be omitted, in which case the omission is shown by putting the complement of the omitted preposition into the accusative. If another accusative is near, use **je** to avoid confusion. Thus, "He came on Sunday last" may be "Li venis en (not sur, on, but **en**, in) la pasinta dimanĉo" or "je la pasinta dimanĉo" or simply "la pasintan dimanĉon."

18. The prepositions **al**, towards; **ĝis**, as far as, up to, until; and **tra**, through, indicate "direction towards," and therefore they do not require the accusative of direction. When an adverb is made, to indicate direction, it takes **-n**. Thus, from **hejmo**, a home, the adverb **hejmen** is derived. The accusative of direction is sometimes figurative; as, "Li disŝiris la leteron en pecetojn," "He tore the letter into small pieces."

19. To recapitulate: There are three kinds of accusatives, namely: 1. Object of a transitive verb; 2. Accusative of direction; 3. Accusative to show omission of **je** or of any other preposition.

20. The only auxiliary verb is **esti**, to be. **Havi**, to have, denotes possession, ownership or control, as in English, but is not used to make tenses.

21. The pronunciation of the Esperanto sentences in the preceding twenty numbered paragraphs may be indicated as follows:

"Balai" is "bah-lah-ee. In Esperanto every vowel or diphthong constitutes a separate syllable.



Se la **a** kaj la **i** povus kunmetiĝi tie ĉi, la rezultaĵo estus "balaj," elparolata "bah-ligh." La kunmetigo de anglaj literoj **-igh** estas neordinara, kiel vidigilo al la "longa" sono de **i** en "bite" (bajt, mordi), tamen ĝi estas plej konvena je nia nuna celo.

"Mi amas lin: Mee **ah-mahss** leen." Oni ne elparolu "ahmahz" nek "ammas." La sono de **a**, kiel en **at**, ne ekzistas en Esperanto. En la angla kaj en kelkaj aliaj lingvoj la tiel nomitaj mallongaj sonoj de **a** en **at**, de **i** en **it**, kaj de **u** en **up** estas montrataj per duigado de la konsonanto, kiu sekvas la vokalon. Provonte skribi montri anglalingvajn sonojn per esperantaj literoj, ni eble devos utiligi tiun ĉi rimedon.

"Al, ahl; ĝis, jeece; tra, trah; hejmo, hay-mo; hejmen, hay-men."

"Li disŝiris la leteron en pecetojn: Lee diss-**shee**-riss lah leh-**tehr**-on en pet-**seht**-oy-n."

"La birdo flugas en la ĉambron: Lah **beer**-do **floo**-gahss en lah tchambron." Ne diru "burrdο," nekonscie imitante la anglan vorton "bird."

"La hirundo flugas trans la riveron, ĉar trans la rivero estas aliaj hirundoj: Lah **hee-roon**-do **floog**-eess trahnss lah ree-**vehr**-on, tchahr trahnss lah ree-**vehr**-o **ess**-tahss ah-lee-**igh** **hee-roon**-doy." Ne diru "trahnz" nek "trannz" nek "trannss." Ne diru "rivv-er-o" nekonscie imitante la anglan vorton "river."

"Li venis en la pasinta dimanĉo, je la pasinta dimanĉo, la pasintan dimanĉon: Lee **veh**-neess en lah pah-**seen**-tah dee-**mahn**-tcho, yeh lah pah-**seen**-tah dee-**mahn**-tcho, lah pah-**seen**-tahn dee-**mahn**-tchon."

"Esti: **ess**-tee. Havi: **hah**-vee."

If the **a** and the **i** could combine here, the word resulting would be spelled **balaj** and pronounced "bah-**ligh**." The combination of English letters **-igh** seems unusual for the "long" sound of **i** in "bite," but for our present purpose it is the most convenient.

"Mi amas lin: Mee **ah-mahss** leen." Avoid saying "ahmahz" or "ammas." The sound of **a** in **at** does not exist in Esperanto. In English and some other languages the so-called short sounds of **a** in **at**, of **i** in **it**, and of **u** in **up** are shown by doubling the consonant after the vowel. When we try to write English sounds in Esperanto letters we may have to resort to this expedient.

"Al, ahl; ĝis, jeece; tra, trah; hejmo, hay-moh; hejmen, hay-men. Li disŝiris la leteron en pecetojn: Lee diss-**shee**-riss lah leh-**tehr**-on en pet-**seht**-oy-n."

"La birdo flugas en la ĉambron: Lah **beer**-doh **floo**-gahss en lah tchambron." Do not say "burrdο" in unconscious imitation of the English word "bird."

"La hirundo flugis trans la riveron, ĉar trans la rivero estas aliaj hirundoj: Lah **hee-roon**-do **floog**-eess trahnss lah ree-**vehr**-on, tchahr trahnss lah ree-**vehr**-o **ess**-tahss ah-lee-**igh** **hee-roon**-doy." Do not say "trahnz" or "trannz" or "trannss." Do not say "rivv-er-o" in unconscious imitation of the English word "river."

"Li venis en la pasinta dimanĉo, je la pasinta dimanĉo, la pasintan dimanĉon: Lee **veh**-neess en lah pah-**seen**-tah dee-**mahn**-tcho, yeh lah pah-**seen**-tah dee-**mahn**-tcho, lah pah-**seen**-tahn dee-**mahn**-tchon."

"Esti: **ess**-tee. Havi: **hah**-vee."

## Bonus Plan for Merchandise Sales

(The California Electrical Cooperative Campaign, in endeavoring to stimulate enthusiasm among the inside sales force, advocates a system of bonuses as described below.—The Editor.)

The Advisory Committee, conducting the California Electrical Co-operative Campaign, has been convinced for some time that the contractors and dealers of California could use with profit to themselves a bonus system whereby their sales force would be made to feel that the business's success was their success and induced to put forth greater effort in the sale of electric appliances and in the service rendered by them to the public.

The committee upon investigation discovered many contractors and dealers already using bonus systems. As a result of its investigations the Advisory Committee has approved the following flat bonus system:

In the system recommended outside salesmen or solicitors are not considered, as most of them are working on bonuses. It applies entirely to the inside sales force (the men and women who work in the store) and is in addition to their regular salaries. It has been prepared with one idea in view—that you may secure the fullest co-operation from your sales force and, therefore, make the maximum amount of sales and give the best possible service. An effort is being made to have this plan put into operation January 1, 1920.

There are numerous ways of arriving at the bonus: For instance, on the gross sales, net profits, equal division among the salesmen based on the number of sales, division based on the total sales price, etc. The flat bonus was adopted by the Advisory Committee because it is a simple plan and on account of its simplicity can probably be used

to better advantage, especially at the beginning than other plans more intricate.

Where more than one salesman is employed in a store it is suggested that 50 per cent of the bonus go to the salesman at once in daily, weekly or monthly settlements as the case may be and the other half go into a pool which will be divided equally between the store salesmen at given periods. It is suggested that better co-operation in store sales force can be obtained by having each salesman feel that he is interested in the sales made by each of the other salesmen as well as in his own sales and that there will be more of a tendency for everybody to boost the other fellow's sales; that is to say, that if one salesman makes an especially good record, the others will be glad of it rather than envious. The plan fixes the flat bonus for appliances as follows:

Household irons .....	10c	Disc stoves .....	20c
Tailor irons .....	15c	Toaster stoves .....	20c
Chafing dishes .....	20c	Hot plates .....	20c
Curling irons .....	10c	Waffle irons .....	20c
Grills .....	20c	Toasters .....	15c
Air heaters .....	20c	Vacuum cleaners .....	\$1.00
Foot warmers .....	15c	Electric sewing machines.....	\$1.00
Warming pads .....	10c	Washing machines .....	\$1.50
Ovenettes .....	10c	Fans (under \$15) .....	15c
Percolators .....	20c	Fans (over \$15) .....	25c
Coffee urn heaters .....	20c	Vibrators .....	20c
Immersion heaters and milk warmers .....	10c	Sewing machine motors .....	25c
		Hair dryers .....	25c

This plan might be enlarged upon by paying higher bonuses on shopworn goods and by including many articles in stock which are not on this list.



## SPARKS—Current Facts, Figures and Fancy

(Fish and hens are among the latest victims of applied science, and a certain unfortunate bull is being utilized, along with volcanoes and tides, to generate electric power. Recent statistics show that the United States holds an important place in the world's markets, but might be wealthier if smokers and aviators were prohibited.—The Editor.)

Oregon has more water power available for development than has any other State in the Union.

\* \* \*

A new source of power has been evolved in Montana: a bull runs a treadmill which furnishes power for a milking machine in the dairy barn.

\* \* \*

The fishing interests on the California coast are about to take a mean advantage of the fish by using airplanes to locate schools of sardines. The air-pilots will inform the skippers of the fishing boats of the whereabouts of fish schools by means of radio communication.

\* \* \*

A London firm, finding many of its horses commandeered for war services, and the shortage of gasoline precluding the use of gasoline motor trucks, had recourse to electrically-propelled vans, of which it built up a large fleet. Current for their operation cost about 2 cents per unit.

\* \* \*

Plans for building a canal running parallel to the Rhine River from Huningen to Strasbourg, a distance of about 80 miles, have been perfected by the French Government. The canal would be built and operated in such a manner as to permit the construction of ten hydroelectric stations with a total capacity of seven million horsepower.

\* \* \*

In spite of their vacuous and detached expressions hens seem to like being in the limelight. It has recently been discovered by some astute agriculturist that by electrically illuminating the pens during the off-season between November and April, he obtained one dozen eggs more per fowl than were produced by those kept in unlighted pens.

\* \* \*

Further disconcerting statistics are forthcoming from the society for the propagation of useless knowledge: five thousand matches are struck every second by smokers in the United States. It is further estimated that these same smokers cost the United States sixteen dollars a minute by carelessly throwing their cigarette stumps into hay ricks, ammunition factories, and national forests.

\* \* \*

Plans for harnessing tidal power are definitely under way in France and are being considered in England. The French scheme is to build huge concrete reservoirs which will throw open their locks at high tide, and by a series of mill races supply motive power to huge generators. A plan to harness the tidal power of Langstone Harbour, Portsmouth,

has been put forward in England, it being estimated that about 20 million tons of water flow in and out every day.

\* \* \*

A pocket electric fan which ladies can carry to balls in their handbags is one of the latest inventions of some unromantically efficient mind. It consists of a fan and battery, and is switched on by the pressing of a button. Somehow we dare not predict much popularity for it. What joy is there for an infatuated and attentive partner in the mere pressing of a button? And how can ladies be expected to waste their time manipulating anything so distinctly un-decorative?

\* \* \*

It seems that aerial navigation regulations are being issued to prevent contraband trade. It is directed that goods-carrying airships before leaving a country shall proceed to a fixed rendezvous and have their freights examined. Arriving over foreign soil they must land at a given depot and submit to the customary overhaul by the customs man. Personally we feel tempted to predict a glorious resurrection of romantic smuggling days, with diamond-laden planes dashing over frontiers pursued by aerial customs-house officials.

\* \* \*

A new electric device was used for the first time at a recent ship-launching. The device consists of four electrically controlled guillotines through which the launching cables pass. At a given signal the pressure of a button causes the knives of the guillotines to fall and sever the cables. This method does away with the dangerous practice hitherto used in sidewise launchings of hacking the cables with axes, according to officials of the yard. The method insures that the vessel shall be released at both bow and stern at the same moment and strike the water with an even keel.

\* \* \*

A recent estimate indicates that while the United States has only 6 per cent of the world's population and only 7 per cent of the land, it produces 60 per cent of the world's copper; 40 per cent of the world's lead; 50 per cent of the world's zinc; 60 per cent of the world's aluminum; 66 per cent of the world's oil; 75 per cent of the world's corn; 60 per cent of the world's cotton; 40 per cent of the world's silver; 52 per cent of the world's coal; 40 per cent of the world's iron and steel; 20 per cent of the world's gold; 85 per cent of the world's automobiles; 25 per cent of the world's wheat. It also refines 80 per cent of the world's copper and operates 40 per cent of the world's railroads.



## PERSONALS

**G. E. Armstrong**, protection engineer for the Southern California Edison Company, has resigned to become associated



with the editorial staff of the McGraw-Hill Company, publishers of *Electrical World*, *Electrical Merchandising*, and the *Journal of Electricity*, and will have his headquarters in San Francisco under the general direction of Robert Sibley, editor of the *Journal of Electricity* and *Pacific Coast* editor of the *Electric World* and *Electrical Merchandising*. Mr. Armstrong's rapid rise in the field of journalism has been a subject of comment in

many quarters. He attended the University of California with the class of 1914. Since leaving the university he has been engaged in various engineering activities of the Southern California Edison Company and has acquired a wide experience in matters pertaining to hydroelectric generation and long distance transmission of electrical energy. His signed writings on these subjects have appeared in the columns of the *Journal of Electricity* and the *Electrical World* on many occasions during recent years as well as in the transactions of the American Institute of Electrical Engineers. The acquisition of Mr. Armstrong to the McGraw-Hill staff is in line with the ever-increasing desire to build up the *Electrical Trio*—*Electrical World*, *Electrical Merchandising* and *Journal of Electricity*—to the highest standards attainable.

**E. B. Bumsted**, consulting engineer of San Francisco, has returned to that city after a business trip to New York.

**H. B. Schiefer**, engineer of Cleveland, Ohio, has become associated with the Meese & Gottfried Company of San Francisco.

**E. H. Bell** has taken charge of the new office recently opened by the Electric Material Company in Los Angeles, Title Insurance Building.

**T. E. Bibbins**, president of the Pacific States Electric Company, has recently returned to San Francisco from a business trip in the Northwest.

**Richard Chamberlain**, Northwest manager for the Hurley Machine Company, headquarters Seattle, is making a visit to the factory at Chicago.

**James T. Whittlesey**, consulting engineer for the Universal Gas & Electric Company, is back in San Francisco after a six weeks' visit in New York City.

**Wynn Meredith**, Pacific Coast manager for Sanderson & Porter, has returned to San Francisco from a business trip to New York City and other points in the East.

**E. N. Brown**, president and general manager of the Majestic Electric Company, has returned to San Francisco after a thirty days trip through the Eastern States.

**K. K. Carrick**, traffic manager of the Pacific Northwest Traction Company at Everett, Washington, since 1910, has resigned to become connected with the Bank of Commerce in that city.

**Roy J. Heffner**, in charge of technical courses in the Extension Division, University of California, left December 24th for a visit to New York City, Washington, and other Eastern cities.

**G. C. Pierce**, vice-president and general manager of

the Northwestern Electric Company, spent some days in San Francisco recently while on a business trip down the Pacific Coast.

**M. M. O'Shaughnessy**, City Engineer of San Francisco, was elected president of the San Francisco branch of the American Society of Civil Engineers at the annual meeting on December 16th.

**D. C. Henny**, consulting engineer of Portland, Oregon, has been appointed as the consulting engineer for the Columbia Basin project, for which the State of Oregon appropriated \$100,000 for preliminary investigation.

**John Ryan**, local manager of the Western Electric Company, Portland, has been confined to his home with a serious case of blood poisoning in his hand, contracted from a slight cut which he got in adjusting his automobile.

**A. H. Lawton** of the Duplex Lighting Works of the General Electric Company, 6 West 48th Street, New York City, with headquarters at San Francisco, spent ten days in Seattle recently while making a trip through the territory.

**Prof. Y. Furuya** of the electrical engineering department of Kuishiu University, Japan, who is touring the United States in connection with the more extensive teaching of electrical engineering in Japan, was a recent Salt Lake City visitor.

**A. G. Moler**, formerly district superintendent at Virginia City, Nev., for the Truckee River General Electric Company, has been transferred to Carson, Nev., where he succeeds T. A. Kearney in charge of the lines and business of that district.

**H. J. Jones** has resigned as secretary of the Oregon Association of Electrical Contractors and Dealers and J. P. Mundt has been appointed in his place. Mr. Mundt has just been discharged from the regular army after ten years' service and had risen to the rank of captain.

**A. M. Hunt**, electrical engineer, is visiting San Francisco. In former years, he was actively associated with many power enterprises in the West. During the war period, Mr. Hunt was a member of the Naval Consulting Board, of which Thomas A. Edison was chairman.

**A. L. Martin**, manager of the Marshfield, Oregon, division of Mountain States Power Company, has been appointed by the County Court to meet with the court and representatives from every district of the county to lay out a road program for the coming year.

**A. R. Fierce**, well known for many years past as an electrical jobber in Southern California, has started the Wholesale Electric Company at 817 Mission Street, San Francisco. His announced policy will be to do strictly a wholesale business, only selling to those contractors and dealers who are entitled to a wholesale price.

**Tom J. Bennett**, of the Rex Electric Company, San Francisco, was elected president of the Electrical Contractors



and Dealers' Association of San Francisco, at the meeting of December 19th. Mr. Bennett has been a leader in contractor-dealer activities of California for a number of years and has been prominent in the San Francisco Electrical Development League. Last year he served on the conference committee of the local association. In his new office he succeeds Clyde L. Chamblin, who takes up his duties as president of the

California State Association of Contractors and Dealers at the first of the year.



Wilfred Sykes, in charge of the application of electricity to ship propulsion for the Westinghouse Electric & Manufacturing Company, East Pitts-



burgh, Pa., has been visiting the various important Pacific Coast ports during the past month. Mr. Sykes has had direction of the design, construction and installation of electrical machinery on the U. S. S. "Tennessee" and other battleships being built for the United States Navy. Before entering upon his present specialized field, he was for several years in charge of the application of

electricity to steel mills for the Westinghouse Company. Mr. Sykes is a member of the board of managers of the American Institute of Electrical Engineers.

John H. Allison has joined the sales engineering department of the Celite Products Company, producers of Sil-O-Cel insulating products in the Pittsburgh district. Mr. Allison is a graduate of the Mechanical Engineering Department of the University of Pittsburgh and has had broad experience in the industrial field.

Douglas Brookman, who has been connected with the California State Railroad Commission for the past seven years, will enter private practice with the first of the year. For three years Mr. Brookman has been a member of the valuation committee of the National Association of Public Utility Commissions and has handled many important rate cases for the State Commission.

E. M. Cutting, formerly Pacific Coast manager of the Edison Storage Battery Company with headquarters in San Francisco, and who recently went east as manager of the Edison Company's railroad department, has severed his connection with that organization. Mr. Cutting's plans are indefinite, but include a possible return to the Pacific Coast, where his many friends look forward to seeing him again in this field.

F. S. Montgomery, for the past six years advertising manager, National Metal Molding Company, Pittsburgh, and prior to that for several years district manager in charge of the Atlanta office of the same company, tendered his resignation, to take effect December 31st, and will be associated with the Ivan B. Nordhem Company, outdoor advertising, 8 West 40th Street, New York City. Mr. Montgomery's successor has not been announced.

W. A. Hillebrand, formerly electrical engineer with the Pacific Gas & Electric Company, and recently engineer with the Ohio Brass Company of Mansfield, Ohio, has been appointed Pacific Coast engineer for the latter company, with headquarters at the San Francisco offices of the Holabird Electric Company. Mr. Hillebrand has just returned to the Pacific Coast with H. H. Hoxie, insulator sales specialist for the Holabird Electric Company.

P. J. Givnan, formerly with the Wagner Electric Company, St. Louis, and later for eleven years with the Kilbourne & Clark Manufacturing Company, makers of radio apparatus at Seattle, has started business for himself at 538 First Avenue South, Seattle. He will make a specialty of motor, dynamo and radio repairs. Givnan came to the Kilbourne & Clark plant as factory superintendent, became factory manager, superintendent, general superintendent and acting manager.

C. E. Grunsky, consulting engineer of San Francisco and well known to readers of the Journal of Electricity as the author of important articles involving valuation theory

and practices, has been elected president of the Commonwealth Club of San Francisco for the coming year. The Commonwealth Club is one of the most important civic organizations in the West and has done much in service of the common good through its research committees, along engineering as well as economic lines. Mr. Grunsky is at the present time also president of the California Academy of Sciences and a director of the American Society of Civil Engineers.

Robert Sibley, editor of the Journal of Electricity, together with Mrs. Sibley, has returned from a month's visit to the East where he spent much time in meeting men of the industry in Chicago, New York, Boston, and Washington. In three of the dinners given in his honor while in the East he placed the story of the electrical West by means of diagrams, charts, and lantern slides, before editors and managers of eighteen national magazines, among them the Saturday Evening Post, the New York Tribune, Scribner's, Engineering News-Record, Electrical World, and Power. Among men prominent in the electrical industry present were: F. H. Gale, J. C. McQuiston, P. L. Thompson, D. R. Bullen, J. J. Gibson, W. C. Peet, W. L. Goodwin, James H. McGraw, W. H. Onken, Jr., O. H. Caldwell, F. M. Feiker, M. H. Aylesworth, R. S. Hale, and M. S. Seelman.

R. H. Ballard, vice-president of the Southern California Edison Company, and president of the National Electric Light Association, is again planning to make one of his nationwide tours in behalf of the great electrical gathering to be held in Pasadena, California, May 18-21, 1920. He is expected in San Francisco on Monday, Jan. 12, 1920, when a monster Electrical Development League luncheon will be held at the Palace Hotel to give him and Mr. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, a farewell send-off to the East. Mr. Britton goes East in behalf of the public policy meeting of the Association, and great interest is being manifested in the East awaiting the arrival of these two Western men, who are doing such splendid work in behalf of the electrical industry the nation over.

F. B. Jewett, chief engineer of the Western Electric Company, one of the most eminent telephone engineers of this



country, has been making an extended visit to the West and is now in Pasadena, California, the place of his birth. Dr. Jewett during the war was Lieutenant-Colonel in the Signal Corps and has been decorated with the Distinguished Service Medal for his notable achievements in wireless telephony and in the perfection of devices for detecting hostile submarines. During his Western tour he has spoken in San Francisco,

Los Angeles, Seattle, Portland, Salt Lake City, and elsewhere on "Some Wartime Developments in Electrical Communication and Allied Fields." Graduated from Throop Polytechnic Institute, Pasadena, in 1898, with the degree of B. A. in electrical engineering, he went to the University of Chicago, where he received the Ph. D. degree in 1902. From that year to 1904 he was instructor in physics and electrical engineering at Massachusetts Institute of Technology. Dr. Jewett's connection with the telephone world began in September, 1904, when he became transmission engineer for the American Telephone and Telegraph Company. In April, 1912, he became assistant chief engineer of the Western Electric Company in charge of all development and research work. He has been chief engineer since 1916.



## Meeting Notices for Electrical Men

(Most important among recent activities are the meetings of the various committees of the National Electric Light Association, and the organization's plans for the future. Engineering societies in the Northwest report interesting programmes, and meetings of considerable importance have been held both in San Francisco and Los Angeles.—The Editor.)

### DENVER MEETINGS OF N. E. L. A. COMMITTEES

#### Overhead Systems Committee

The Overhead Systems Committee held meetings in Denver, Colorado, on December first, second and third. The meetings were held in the offices of the Denver Gas and Electric Light Company, whose officers were most courteous to the committee throughout their entire stay and provided every facility for conducting the committee work in a comfortable and efficient manner.

The meeting was well attended by members from both the Western and Eastern sections of the country. Those in attendance were as follows:

Markham Cheever, Utah Power & Light Co., Salt Lake City.  
R. L. Baker, H. L. Doherty & Co., New York City.  
Thomas Sproule, Philadelphia Electric Co., Philadelphia, Pa.  
W. T. Oviatt, Narragansett Electric Lighting Co., Providence, R. I.  
W. T. Morrison, New York Edison Co., New York City.  
L. M. Klauber, San Diego Consolidated Gas & Electric Co., San Diego, Cal.  
R. E. Cunningham, Southern California Edison Co., Los Angeles.  
W. G. Kelley, Commonwealth Edison Co., Chicago, Ill.  
R. A. Hammack, Denver Gas & Electric Light Co., Denver, Colo.  
H. H. Kerr, Denver Gas & Electric Co., Denver, Colo.  
John B. Fiske, Washington Water Power Co., Spokane, Wash.  
H. R. Wakeman, Portland Railway, Light & Power Co., Portland, Ore.  
A. E. Silver, Electric Bond & Share Co., New York City.  
J. E. Woodbridge, Sierra & San Francisco Power Co., San Francisco.  
W. K. Vanderpoel, Public Service Electric Co., Newark, N. J.

Reports of the various sub-committees were submitted and it was found that there had been a very gratifying response to the questionnaires issued by the sub-committees. From the data in hand it was indicated that much interesting information can be collected regarding new construction and maintenance methods and devices. The greatest interest is being displayed in the question of insulator maintenance, so that more information can be collected regarding their operating performance and the necessary remedies can be worked out to eliminate the causes of insulator failures. It was felt at the meeting that a special study should be made of the causes of failures of suspension insulators and that such research should be continued until this part of the outside plant equipment can be depended upon to give continuous and satisfactory results. There were interesting discussions and developments regarding many construction and maintenance details and before the meeting adjourned a comprehensive plan had been made to develop all of these subjects for presentation in the yearly report of the committee.

A resolution was passed by the committee expressing its very sincere appreciation of the courtesies extended to it by the Denver Gas and Electric Light Company. The gentlemen who were particularly active in taking care of the

Overhead Systems Committee were: Mr. R. L. Baker, Mr. T. O. Kennedy, Mr. H. H. Kerr and Mr. R. A. Hammack.

#### Inductive Interference Committee

The second meeting of the Inductive Interference Committee of the National Electric Light Association was held in Denver, Colorado, on December 1, 2 and 3, 1919. The meeting was well attended by members from many parts of the country, with a liberal proportion of Western representatives, owing to the geographical location.

Some of the sessions were devoted to a continuation of the attention given at the Chicago meeting in September to organizing for the work in hand, including the establishing of a centralized agency to assist power companies to effective cooperative effort and a better understanding in meeting the difficult problems of the inductive interference situation—a situation continually increasing in proportion with the rapid multiplying of power and communication circuits.

Other sessions were given to sub-committee work in analyzing and compiling information gathered pertinent to the situation, and to consideration of requests from several localities for advice in meeting specific and active inductive interference problems.

The discussions lent renewed emphasis to the committee's realization of its need for thorough support from the power companies, at this stage, by contributing information of their experience and methods of meeting the problems of this kind encountered.

The chairman of the committee is A. E. Silver of the Electric Bond and Share Company, 71 Broadway, New York City.

#### Electric Metermen's Association

A meeting of the Electric Metermen's Association was held at the Hotel Whitcomb, San Francisco, on December 26th at 6:30 p.m., J. E. Bridges in the chair. There were present meter department and district heads representing all the power companies in the state north of Bakersfield. The gathering was a large one, and included, in addition to the regular members, S. P. Russell and Lloyd Henley of the Railroad Commission, who comprised a committee on Safety Rules for meter installations.

Papers were presented by J. C. Abel, on "Safety Meter Installations," and A. E. Coney on "Reactive Component Measurements," and were followed by general discussion.

O. A. Knopp reported on the progress being made by the N. E. L. A. meter committee with regard to the convention to be held at Pasadena in May.

The meeting adjourned at 10:45 p.m.

### BUILDERS OF THE WEST—LXVIII



JOHN CAMPBELL MERRIAM

Forces of research and investigation have long been quietly at work in the upbuilding of the West—none the less important because much of their work goes unobserved by the general public. Nobly typifying these essential forces is Dr. Merriam, Professor of Palaeontology at the University of California, where his activities have been engaged for a quarter of a century. As an authority on fossil reptiles and mammals of Western North America, and on the general historic geology of this region, he has gained worldwide recognition—particularly for his studies and discoveries of the fossil remains in the asphalt pits of Rancho La Brea, California. Dr. Merriam is president of the Geological Society of America; member of the Explorations Committee of the National Research Council, and of many learned societies. His labors have added greatly to the intellectual standing of the West. To Dr. John Campbell Merriam, scientist and educator, this issue of the Journal of Electricity is therefore affectionately dedicated.



### NATIONAL ELECTRIC LIGHT ASSOCIATION

Important meetings at which the enlarged program for the future activities of the National Electric Light Association is to be discussed will be held in New York in January.

A meeting of the Public Policy Committee will be held at the headquarters in the Engineering Societies Building on January 29th. John A. Britton, chairman of the committee, will come from San Francisco to preside. President R. H. Ballard of Los Angeles will also be present. It is expected that the full membership of the committee will be present. Suggestions and advice will be requested from the committee in regard to the future activities of the Association and the new program which is now being arranged.

The Executive Committee meeting will be held on January 30th. Action will be taken on the program for future activities and an effort will be made to settle definitely the matter of the Geographic Sections. In speaking of the progress which is being made in the organization of the central stations of the country into Geographic Section affiliation with the N. E. L. A., M. H. Aylesworth, executive assistant to the president, said, "The outlook is very encouraging. The plan is receiving widespread favorable comment and many state organizations have shown a desire to aid in carrying it through."

### N. E. L. A. EXECUTIVE COMMITTEE

Much business pertaining to the general affairs of the National Electric Light Association was transacted at the meeting of the Executive Committee on December 4, a report of which has just been made available. Vice-President Martin J. Insull presided.

Walter Neumuller, chairman, Membership Committee, reported that its program is under way with several campaigns well advanced. The committee expects early in the new year gratifying results from its efforts.

Frank A. Birch, chairman, Company Sections Committee, outlined the work accomplished by his committee. The committee recommends that a bureau be established at headquarters for the supervision of Company Section work. A sub-committee of the Executive Committee will study the report of Mr. Birch and report at a later meeting.

Vice-President M. R. Bump reported on the situation as to geographic sections. A letter has been sent to all member companies in the districts not already organized calling attention to the tentative division of the country and asking for suggestions and support. The committee hopes to receive many suggestions and plans to send out another general letter.

M. H. Aylesworth, executive assistant to the president, reported on the rearrangement of offices at headquarters and also on his attendance at the convention of the National Association of Railway and Utility Commissioners, in Indianapolis on October 14. He also told what was being done to relieve the shortage of coal during the strike, which was then in progress.

Mr. Aylesworth spoke also of the letter which he sent recently to the executives of Class A companies, outlining part of the program for future activities of the association and asking for suggestions as to how the work could be improved. Hundreds of answers to this letter have been received and they show careful thought. He also urged that greater interest be taken by the executives of member companies in the company section work.

Chairman Symes of the Accounting Section reported that a well attended meeting of the Executive Committee of that section was held in Detroit on October 20. The Accounting Section Committee is ready to confer at any time with the committee from the National Association of Railway and Utility Commissioners on the subject of a uniform classification of accounts.

Secretary Marshall of the Electric Vehicle Section reported on its work, as Chairman Foster was not present.

For the Technical Section, Chairman Moulthrop reported that the work is going along smoothly and energetically. Four representatives from the Pacific Coast were present at a recent meeting of the Executive Committee of the Section and better cooperation between the East and the West will result.

Chairman Learned of the Commercial Section reported that following the successful series of meetings in October in Chicago, about ten or twelve meetings are planned to be held in New York on January 5, 6 and 7. This method of grouping meetings will make for efficiency and minimize traveling expenses.

The committee indorsed the movement for formation of a National Department of Public Works.

### Electrical Contractors and Dealers' Association of San Francisco

An important amendment to the constitution, providing for authorized representatives of firms to attend regular meetings and vote in behalf of the firms, was passed at the meeting of December 12th. Several changes in the by-laws were also effected. Provision was made for appointment of a legislative committee, standardization committee, and supplies committee, and the duties of each outlined. A report was received from the special committee on cooperative advertising by contractors, but action was deferred.

The main business of the meeting of December 19th was the election of officers for the year 1920. Those chosen were: T. J. Bennett, president; W. R. Mobley, vice-president; Victor Lemoge and T. de Pass, members of the Conference Committee; C. F. Butte, member of Building Industries Board of Governors; T. J. Bennett and Earl Browne, members of State Executive Committee.

### A. I. E. E., Seattle Section

The American Institute of Electrical Engineers, Seattle Section, held an interesting meeting and election of officers on the evening of December 16. J. Helenthal, chairman of the membership committee, reported on the work of that committee, showing the increase for the last year as well as the two years previous. G. E. Quinan, chairman of the Papers and Meetings committee, reported on the program of the section for the past year and called attention to the success of the plan adopted of having a program of the meetings of the year, which was carried as arranged with one exception. T. C. Smith, secretary and treasurer, made his report, which was accepted. The resignation of A. A. Miller as one of the counselors of the Associated Engineering Societies, was accepted. S. C. Lindsay, the other counselor, reported on the last meeting of the Associated Engineering Societies, which was also attended by the chairman of the Section, John Harisberger. The question of licensing engineers, which is to be up for consideration by the coming legislature of Washington, was an important matter of discussion. The endorsement by Pacific Coast Sections of the recommendation of the Seattle Section, of the name of Dr. Magnusson of the Seattle Section, for vice-president, was asked.

The subject of discussion for the evening was "Radio Engineering in the Thirteenth Naval District," and was presented jointly by R. H. Marriott and Dr. H. H. Lester of the Bremerton Naval Station Radio Laboratory. Dr. Lester outlined the scope of the work done by this district, explained the fundamental principles and circuits, and showed the desirability of the new trans-Pacific wireless route from Keyport to Vladivostok via St. Pauls Island on the coast of Alaska. This route is about 2700 miles long as compared to about 7,000 between San Francisco and the Philippines via Honolulu.



Mr. Marriott gave a description of a method invented by him for guiding ships into narrow crooked channels and gave a demonstration with experimental apparatus. This method consisted of passing a small alternating current through a cable laid along the desired course in the channel and determining its location by means of induction in a coil of 2000 turns of wire, arranged so as to be adjustable. The coil is turned until the maximum induction is obtained, as determined by means of head phones when it points toward the cable.

Mr. Jefferson of the Kilbourne & Clark Manufacturing Company, local makers of radio apparatus, had a one-quarter kilowatt radio set of the commercial type on exhibition and gave a demonstration, bringing out in his discussion the simplicity and ruggedness of the apparatus. In reply to the question as to what current was used in the tests which Mr. Marriott had made, he replied seven-tenths of an ampere, which was the maximum amount possible with 40 volts, the rating of the cable used.

At the election of officers which followed the paper and discussions, G. E. Quinan was elected chairman and Willis T. Batcheller secretary-treasurer.

#### San Francisco Electrical Development League

At the December 15th meeting of the San Francisco Electrical Development League, P. J. Hennessy of the Southern Pacific Company presented an interesting address on the "Plumb Plan" of railroad control. Mr. Hennessy discussed the salient features of House Bill 8157, containing the provisions of the "Plumb Plan," which he declared detrimental to the best interests of the people of the United States. R. Earl Fisher acted as chairman of the day.

The concluding luncheon meeting of the year was the Christmas celebration of December 22nd, in the ballroom of the Palace Hotel—the largest and most successful gathering ever held under the auspices of the League. Present as special guests of the League were fifty-seven children from the San Francisco Nursery for Homeless Children, who were delighted by the good things of the table and the many presents on the Christmas tree. F. D. Fagan, San Francisco manager of the Edison Lamp Works of the General Electric Company, was the bountiful Santa Claus of the occasion, distributing the gifts not only to the orphan children but also to the children of members, who attended in goodly numbers. E. O. Shreve, president of the League, welcomed the youthful guests and told of the plan to make the Christmas tree celebration an annual event. This festivity, he added, was made possible by a system of cheerfully-given fines imposed on the members at meetings throughout the year.

The arrangements for the luncheon and entertainment were in charge of Arthur Kempston.

#### American Association of Engineers

The American Association of Engineers has just organized local chapters in the following cities: Gray's Harbor, Everett, Bellingham, Seattle, Tacoma and Bremerton Navy Yard, all in the state of Washington.

#### Pacific Service Employees' Association

At the unique and enterprising Christmas entertainment given by the Pacific Service Employees' Association at the Scottish Rite Auditorium on December 23rd, a one-act musical comedy entitled "Love O' Lights" was the feature of the evening. The book and lyrics were by Fred S. Myrtle, and the music by Lowell Moore. The synopsis is given as follows:

Monoxide Gas, Esquire, is a roystering blade who has enjoyed considerable notoriety in the sphere inhabited by himself and his numerous retinue. In the past he has been regarded as an almost intolerable nuisance, but now he is showing signs of reformation and discarding his vices one by one. To complete his regeneration he thinks of wedlock and his ambition is to ally himself in the bonds of holy matrimony with Miss Electra, a dainty, sprightly miss who, with her equally sprightly band, spirits of light, has charmed all within her reach and has made herself so generally attractive that she has succeeded in almost putting Monoxide Gas and his crew in the shade.

How Monoxide Gas and Miss Electra come together is told in the play. Interspersed among the principal characters are beings known as Grooms, who assume various guises in their general scheme for upsetting things and standing in the way of all happiness and progress. A happy interlude is furnished by the Matrimonial Parson, whose eye for business makes him useful at the right moment. The whole closes with a chorus of cheer, in the course of which is presented a tableau with the Spirit of Service in a halo of glory, receiving homage from all. The presence of Father Christmas with seasonal offerings lends appropriate color to the final picture.

The scene is laid in a forest in Wonderland.  
Time, the present.

The comedy, which was a signal success, both in conception and execution, was preceded by Christmas carols, sung by the Pacific Service chorus, and a brief Christmas address by Charles Pryde Cutten. The evening concluded with an informal dance.

#### Meeting of District Agents

At a meeting of the district agents of the Southern California Edison Company, held in the assembly room, Edison Building, Third and Broadway, Los Angeles, Tuesday, December 30, 1919, the program was as follows:

1. Load Dispatching in Emergencies.....W. L. Frost
2. Presenting Stock Selling Plans to Employees.....F. B. Lewis  
A. N. Kemp
3. The Man in the Company.....A. B. Wollaber
4. Developments in Industrial Lighting.....C. M. Masson
5. Intra Company Courtesy.....W. L. Percy
6. Relation of Edison Benefit Fund to Pension Plan.....W. A. Brackenridge
7. Changes in Accounting for Sales Department and Consumers  
Accounts.....C. P. Staal
8. Operating Observations.....A. E. Morphy
9. The Outlook.....R. H. Ballard
10. Power Development Program.....J. A. Lighthipe
11. Opportunities.....B. F. Pearson
12. The Art of Conciliation.....S. M. Kennedy

#### Westinghouse Meeting

Westinghouse dealers from all points in Southern California attended the big Get-Together Dinner given by the Illinois Electric Company at the Jonathan Club, Los Angeles, in honor of B. S. Manuel, manager of the Westinghouse Electric Products Company of Mansfield, Ohio.

C. B. Hall was toastmaster of the banquet and first called on Captain Howard Angus, secretary of the California Electrical Cooperative Campaign, who outlined the plans for the publicity campaign being conducted by the joint efforts of the California Cooperative Campaign and the Publicity Committee, Pacific Coast Section, N. E. L. A.

From Captain Angus it was learned that the purpose of the Campaign is to establish in every newspaper of California an electrical page or section at least once a week. To this end the various power companies have taken advertising space in the newspapers in their respective territories and in practically all parts of the State have established a definite advertising schedule showing the size and date they will run these advertisements. This information has been sent to the electrical dealers to enable them to tie in and concentrate their advertising on the same day on the same page, creating a smashing effect, which is bound to create a big demand for electrical labor saving devices throughout the year and especially during the Christmas season.

B. S. Manuel spoke most enthusiastically about the work of the California Cooperative Campaign and the results being accomplished.

He outlined the difficulties being encountered by the Eastern manufacturers in not being able to secure raw material and gave the dealers the assurance of the Eastern manufacturers' earnest efforts being lent towards further increasing their production to meet the ever increasing demands.

Mr. Manuel told in a very interesting manner the development of the Westinghouse line. Many years ago the Westinghouse started in the appliance business by manufacturing an electrical toaster stove, since which they, with a few improvements, have remained a pioneer in the electrical field, and its development has a great deal to do with the great development of the fastest growing business in the world—the electrical household appliance business.

He told of the great expansion of his company and of the new factory recently built at Mansfield, Ohio, where a



great increase in the production of appliances has been obtained and a complete line of electrical household appliances developed.

G. E. Arbogast of the F. E. Newberry Electric Company spoke briefly on the development of the household appliance business in Southern California and was very enthusiastic over the future of this business.

He said that with the coming cooperative advertising campaign he thoroughly believed the sales of appliances would show a marked increase and believed that the campaign would be a big boost in establishing the electrical dealers as the logical distributors of electrical appliances.

#### Power & Traction Mutual Aid Association, Utah

New officers have been elected for the Power & Traction Mutual Aid Association for the year 1920. W. M. Scott was elected president; Wm. Cocking, vice-president; A. M. Rust, treasurer; J. R. Mathews, secretary; George Partridge, auditor, and Dr. C. E. Openshaw, physician. The association provides insurance and health protection for employees of the Utah Power & Light Company and the Utah Light & Traction Company at a nominal cost on a mutual plan.

#### Committee for the Encouragement of Wiring Publicity

As a result of a paper read before the Commercial Committee of the Pacific Coast Section, N. E. L. A. and later discussed at the Executive Committee meeting, a committee has been appointed to secure the cooperation of all the electrical manufacturers in employing certain of their advertising space in the interest of properly wired homes, with particular emphasis on the liberal use of wall receptacles. T. E. Bibbins is chairman of the committee which consists of the following:

I. W. Alexander, San Joaquin Light and Power Corporation; R. M. Alvord, General Electric Company; L. H. Newbert, Pacific Gas and Electric Company; Garnett Young, of the Garnett Young Company; K. E. Van Kuran, Westinghouse Electric and Manufacturing Company, and Robert Sibley, Journal of Electricity.

#### National Department of Public Works

A meeting of the State committee in charge of the campaign for disseminating information on the subject of a national department of public works, was held at the Engineers' Club, San Francisco, on December 22nd, Professor C. D. Marx of Stanford University presiding. It was resolved that more publicity was essential to the project.

#### Postponement of Meeting

In view of the coal crisis, the shutting down of industries and the limitation as to time of operation, etc., the 24th annual meeting of the Chicago Electrical Credit Association set to be held December 11th and 12th at Hotel LaSalle, Chicago, has been postponed to a date which will later be set by the Executive Committee. Hotel LaSalle reservations have been cancelled.

#### WESTERN MEETINGS

Dec. 9. A. I. E. E., N. E. L. A., Portland Sections.—O. L. Le Fever and A. D. Leach—Central Station Heating Problems.

Dec. 10. Electrical Cooperative League—Francis J. Heney—"Profiteering."

Dec. 29. American Institute of Mining and Metallurgical Engineers, Southern California Section—Winter Meeting.

## HAPPENINGS IN THE INDUSTRY

### REPORT OF CALIFORNIA STATE RAILROAD COMMISSION

Declaring that the regulation of public utilities as practiced by the California State Railroad Commission during times that threatened public welfare from many angles has been sustained, the Commission in a letter to Governor Wm. D. Stephens reviews its work during the year ending June 30, 1919. Referring to the settlement of the long-standing controversy between the Southern California Edison Company and the city of Los Angeles, which settlement makes it possible for the city to acquire at a reasonable price the electrical distributing system of the company, the Commission says:

"The Commission realized that there was a rapid drift toward a situation where either the city of Los Angeles must allow its electric power generated on the aqueduct to go to waste or it would duplicate the existing distributing system of Southern California Edison Company. The city already had an investment of millions of dollars in its power project and the electric energy generated on its aqueduct must be put to use. To duplicate the existing distributing system would mean a bitter competitive fight resulting in serious loss both to the city and the company. It was concluded therefore by the Commission that the intelligent procedure would be a purchase of this distributing system by the city."

The final result of conferences, that extended over a period of nine months, was agreement between the city and the company whereby the city was to acquire the distributing plant of the company for a price of \$11,000,000. The whole matter was then put before the people. The agreement of purchase was ratified and the necessary bonds voted to consummate the purchase. The appreciation of the city of Los Angeles for the efforts of the Commission was expressed in a resolution adopted by the Public Service Commission and the city council.

The predicament of the state's utilities, due to the constantly changing operating conditions, according to the Com-

mission, "was reflected principally in applications to the Commission for authority to increase rates, the petitions in every case setting up the claim that increased labor costs and higher material prices had destroyed the margin between financial soundness, with ability to function properly, and profitless operation; between efficient service to the public and service hampered by income insufficient to meet constantly increasing demands for service. These petitions for higher rates covered every class of utility—water, domestic and irrigation; gas and electric; warehouses and transportation, boat, train and auto." Of their actions on the petitions the Commissioners say:

"The Commission found it necessary to grant many increases because of the showing made by the utilities, which was carefully checked, and from investigations made by the Commission's staff. As a matter of fact, the need for increased income for the utilities to enable them to function to the highest point of efficiency was obvious. We believe that on the whole the Commission's rate decisions have been received by the public as necessary acts of fair dealing on the part of the Commission, acts, fair alike to the consumer and the utility.

"In Los Angeles interurban fares were readjusted at an increased rate with but little protest. Interurban rates across San Francisco bay were increased. Charges for warehouse service were advanced largely because of increased wages. Increases ranging from 10 to 20 per cent were granted to twenty-two electric utilities; twenty gas utilities received increases and the Commission readjusted the rates of forty-four water utilities. Most of the increases granted were in the nature of a percentage surcharge upon the existing rates, the Commission preferring to grant what it considers emergency increases rather than disturb the permanent rate structures of the utilities."

"The California public utilities, both from an operating and financial point of view, present an outlook that, we believe, reflects favorably the work of the Commission," is the statement in reference to the figures compiled by its experts for the annual report. They point out that the utilities are going forward with development and construction work to meet the growing needs of the state:

"Hydroelectric companies have started new plants which will entail an expenditure of more than \$25,000,000. The construction work is being actively carried on and some plants will be in operation in 1920 and oth-



ers in 1921. While an expenditure of \$25,000,000 may seem large, we are satisfied that it will not result in an over-production of hydroelectric energy. It will permit the suspension of the more costly generating of electric energy by steam plants, result in the saving of from 2,000,000 to 2,500,000 barrels of fuel oil and a material reduction in operating costs, all tending toward a development that ultimately will bring to the rate payer a maximum of service at a minimum of cost, the real aim of utility regulation.

"Gas companies in 1918 reported net operating revenues of \$5,385,434.26 as compared with \$4,846,210.84 in 1917, the increase amounting to \$539,223.42.

"Electric companies reported for 1918 net operating revenues of \$16,969,638.87 and for 1917, \$16,123,663.47, the increase amounting to \$845,975.40."

Distribution of the state's electric energy under the plan devised by the Railroad Commission as a means of meeting the abnormal demands for power created by the enormous industrial growth of the state, due to war's demands, was continued beyond the war period, the plan having withstood the strain placed upon it and enabled the thirty utilities which joined in the conservation-of-power scheme outlined by the Commission to meet every emergency.

"Distinctly a war measure," says the Commission, "the pooling of power and its distribution from a central source proved so efficacious that the utilities themselves, though relieved of the actual strain upon their resources produced by excessive industrial demands, determined upon its continuance, the only difference in its operation in peace times as against war times being the elimination of restrictions placed upon unnecessary industries."

The following indicates the importance to the state of the Commission's "pooling-of-power" plan:

"Power Administration, as outlined by the Commission, practically assures for the state a power situation that can be relied upon for any emergency, its usefulness having been proved by the test of war as well as the ever-recurring shortage following an abnormally dry period. With all the companies in the northern and central part of the state interconnected, as they now are, and the southern companies also interconnected, the danger of power failure in California is reduced to a minimum."

The report tells of the filing with the commission of annual reports of 819 public utilities. These reports cover the financial activities of 62 steam railroads, 34 electric railroads, 2 express companies, 25 water carriers, 75 electric companies, 27 gas companies, 13 gas and electric companies, 109 telephone companies, 3 telegraph companies, 7 telephone and telegraph companies, 306 water companies, 142 warehousemen and 14 wharfingers. Of the 819 utilities 96 were new public utilities.

#### RAILROAD COMMISSION AND DISPUTED BILLS

According to the annual report of the Railroad Commission now being printed, one of the busiest departments maintained by the Commission is that in which are received complaints against utilities regarding disputed bills. Its popularity is due to the fact that in November, 1915, the Commission made a ruling that no utility would be allowed to shut off gas, electricity, water, or any other service on account of a dispute over a bill, if the customer deposited with the Commission the amount of the bill and brought the matter to the attention of the Commission. From June 30, 1918, to July 1, 1919, the Commission received 347 complaints due to arguments as to the correctness of bills for service and accompanying the complaints were amounts that totaled \$24,739.08. The money was held by the Commission until the complaints were thoroughly investigated and then an order was issued distributing it in accordance with the facts revealed by the independent investigation. In many cases the dispute was due to misunderstanding on the part of the customer. In others the utility was found to be at fault. In not a single instance was the award of the Commission questioned.

#### POWER PLANT SERVICE INTERRUPTED

The Pacific Light & Power Company were called upon to use every facility in their possession in order to maintain service on their system during the recent blizzard and intense cold spell. Records for the past forty years were broken as

regards low temperature. The following hydroelectric plants were frozen up: Natches, Walla Walla River; Tygh Valley plant on the White River; Tucker Bridge and Powerdale plants at Hood River, and the gas plant at Lewiston. The temperatures ranged from 25 to 40 degrees below zero at these points. In order to maintain service at all, it became necessary to eliminate all street lights, sign lighting, and power loads. Power was obtained from the company's steam plants and from the Long Lake plant of the Washington Water Power Company. Hood River and The Dalles territory were served by power from the White Salmon plant of the Northwestern Electric Company. Coal was allowed by the Fuel Administration for the steam plants.

#### ELECTRIC SERVICE TO BE DELAYED

One new electric locomotive for the Milwaukee's Idaho-Montana service has reached Deer Lodge and another is reported to be in Chicago and about to start west. These may be all the new electrical equipment delivered to the Milwaukee during the present month. In any event not more than two of the passenger motors in service in Montana will be released for shipment to Washington before January 1st. Two weeks' time is required to transform a passenger locomotive for freight service and work will not be started on any of the equipment in Montana until new electric locomotives are received from the East. Afterwards the motors made available for freight service will have to be sent to Othello, Washington, to start the electric service between that point and Puget Sound. On account of the failure of manufacturers to deliver more than two electric locomotives to the Milwaukee in Montana the belief of operating officials is confirmed that electricity will not supplant steam in crossing the Cascade mountains before spring. It is probable that the change will be made about eleven months after the first date fixed by the manufacturers and long after the two other time limits had been set. It is the intention to transform passenger locomotives on duty in Montana to freight motors for service between Puget Sound and Othello so the freight trains of the road can be taken over the mountain ranges by electricity first. New electric locomotives for the passenger service will be sent to the coast later. At present the Milwaukee is using two electric locomotives on the west end in helper service, and this is likely all that can be operated here until some time after the first of the year.

#### SIX-CENT FARE IN EFFECT AT PUEBLO

A straight 6-cent street car fare became effective in Pueblo, Colo., recently, in accordance with an agreement between the Arkansas Valley Railway, Light and Power Company and the Pueblo City Commissioners made some weeks ago. The extra penny has been added so the company can meet the demands of their employes for a wage increase. Pueblo is one of the last cities in the country served with street car lines to adopt the 6-cent fare and the local company has held off from making the raise until the last possible moment. There has been little opposition to the increased car fare and the majority of the people of Pueblo are facing the extra penny charge with the feeling that it was the best way out of the difficulty.

#### CIVIL SERVICE EXAMINATIONS

The United States Civil Service Commission announces open competitive examinations for the positions of civil engineer, and mechanical and electrical engineer, for men only. Vacancies in the Philippine Service, at salaries ranging from \$2,500 to \$3,000 a year, depending upon the qualifications of the appointee, and in positions requiring similar qualifications, will be filled from these examinations, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.



Employees in these positions will be allowed necessary expenses when absent from headquarters in the discharge of official duties.

The requirements for eligibility for appointment to these positions are as follows:

**Civil Engineer.**—Applicants must show that they have had at least three years of preliminary or apprenticeship engineering training or that they are graduates in engineering from a recognized technical school; and (2) that they have had at least three years of responsible experience in the design or construction of (a) irrigation works, or (b) structural steel and reinforced concrete buildings or bridges.

**Mechanical and Electrical Engineer.**—The duties of these positions will be the design and installation of telephone lines, hydroelectric pumping plants and Diesel engines, and other work falling under the general head of electrical engineering. Applicants must show (1) that they are graduates in engineering from a college or university of recognized standing, or that they have had not less than three years preliminary or apprenticeship training; and (2) that they have had at least two years' experience of a responsible character in the design and installation of telephone lines, hydroelectric plants, pumping plants, Diesel engines, or experience in work of a similar character.

### INSURANCE OF EMPLOYEES

Sierra Light & Power Company has put into effect an insurance plan for the benefit of its employes and employees of the Fresno Water Company, Midland Counties Public Service Corporation, Bakersfield and Kern Electric Railway and several other small subsidiary companies. The minimum amount of insurance is \$1,000 for employes of one year's service, graduated to \$1,500 for six years and more. The policy is enjoyed by more than 1,000 men and women employed by the company without personal obligation.

### A MODERN INDUSTRIAL PLANT

Fairbanks, Morse & Co. will start the erection in Beloit this year of the most modern foundry in the world.

It will equal in size and output any foundry on the globe, and when completed will be 900 feet long, 550 feet wide, and will contain 495,000 square feet of floor space. The completed structure will have an ultimate capacity of 350 to 400 tons of gray iron daily.

Every modern, scientific foundry device, every improvement in the casting of gray iron will be incorporated in the Beloit plant.

Electric cranes will carry the raw materials to and from the big cupolas. Electric grab buckets will unload the moulding and core sand and coke. Electric magnets will grip the raw pig iron and remove it from the cars. Electric cranes and conveyors will carry all molten metal from the cupolas to every mould, whether for giant castings of 10,000 pounds or for tiny ones of a few ounces.

Double tiers of windows on the sides and other tiers in the slanting roof of the bays will light the plant evenly. These windows will all be controlled by electric motors, and operated by pressing a button. Other features are a complete ventilation system that will change the air in the vast structure frequently; a complete system of hot and cold shower baths for the entire force, and a modern cafeteria where the men can secure hot meals.

The cost of the plant is estimated at \$1,500,000.

### ELECTRICALLY PROPELLED SHIP

Contracts for electrical machinery for the propulsion of three new battleships have been awarded by the Navy Department; price for three sets \$5,500,000. According to Navy officials electrical propulsion has been successful and no reason has appeared for returning to steam drive. The New Mexico which was the first electrically driven battleship, has given entire satisfaction and the Tennessee, the second to be thus equipped, will shortly be put in commission.

### PUBLIC UTILITY STOCK

To secure funds to meet the cost of construction work made necessary by growth of business, the San Joaquin Light & Power Corporation on Dec. 26th asked the Railroad Commission for authority to issue 35,000 shares of its prior preferred stock. The company asks the Commission to fix the price at which the stock is to be sold. The proceeds from the stock sale are to be expended, under the direction of the

Commission, for construction work not provided for under bond issues that have already been approved by the Commission.

The employes of the Southern California Edison Company having bought practically all of the block of 4,702 shares of stock set aside with the authority of the Railroad Commission for sale to company workmen and heads of departments, the Commission, on request of the company, granted the utility authority to set aside 2,500 more shares to be sold to the employes. The stock is to be sold at not less than \$90 a share and subject to the agreement that has been approved by the Commission.

### COMPARATIVE FIGURES SHOWING ELECTRICAL GAINS

The following tabulation of customers served by the Pacific Gas & Electric Company includes 1,621 consumers taken over from the Northern California Power Company in Chico District. The total number of consumers on the Northern California Power Company's lines at the time of acquisition aggregated between ten and eleven thousand.

#### STATEMENT OF CONSUMERS BY DEPARTMENTS

October 31st	Gas Dept.	Electric Dept.	Water Dept.	Steam Sales Dept.	Total
1907	118,847	52,666	5,505	.....	177,018
1908	129,044	60,164	5,744	.....	194,952
1909	136,791	68,318	6,332	.....	211,441
1910	149,440	81,050	6,673	.....	237,163
1911	163,679	97,207	7,200	63	268,149
1912	193,295	113,571	7,895	197	314,958
1913	205,479	128,871	8,325	258	342,933
1914	217,880	145,278	9,041	314	372,513
1915	227,534	163,577	9,562	365	401,038
1916	230,616	176,131	9,910	395	417,052
1917	241,031	191,449	12,520	427	445,427
1918	252,623	206,584	13,052	449	472,708
1919	266,572	226,286	13,296	424	506,578
Gain in 12 years	147,725	173,620	7,791	424	329,560

### INCREASED BUSINESS FOR POWER COMPANY

The Mountain States Power Company will serve an additional 100 horsepower in motors being installed by the Cascades Contract Company at Albany, Oregon, for operating a new rock crusher. Linn County, Oregon, will purchase current from the company for a 75-horsepower electric hoist, which will replace a donkey engine in the county's gravel pit. A new prune packing plant, requiring 25 horsepower and 250 horsepower additional for the Willamette Valley Lumber Mill will also be served by the company. Twenty electric ranges were sold in a recent electric cooking campaign conducted in Albany.

### TACOMA LIGHT PLANT PROSPEROUS

In ten months the city light plant of Tacoma has earned a profit of \$340,890.55 over the operating expenses of the system, according to a statement filed by Commissioner Davisson in the city clerk's office. This means a little more than \$1000 a day and indicates that the profits for the year will run over \$400,000 by the first of the year. The receipts for October were \$86,682.65 and the operating bill \$28,184.68.

### SAN FRANCISCO LIGHTING SYSTEM

The second day of the campaign to save the "Path of Gold" to San Francisco closed with \$13,345.50 pledged in contracts. Twenty-seven thousand dollars more is needed before the period of anxiety shall have been passed.

Charles F. Gallagher, manager of the Down Town Association, said that the amount already pledged represents the largest property owners and lease-holders. Apathy still marks the sentiment of the smaller firms and tenants.

Owing to the press of time the soliciting force can make but little headway in the signing of contracts, and Mr. Gallagher said that if those who are willing to sign for the three-year period would write, telephone or call at the offices of the Down Town Association in the Phelan Building, much time could be saved.



In commenting on the possibility of losing the "Path of Gold," Chief of Police D. A. White said:

"A brilliantly illuminated street is the strongest weapon the Police Department has in suppression of a crime wave. The removal of the lights from Market Street would be a tremendous step backward from a viewpoint of civic improvement and would be hailed with delight by the criminal element. Coming, as it would, at a time when the people throng the streets during the Christmas shopping period, the dimming of the 'Path of Gold' would mean an increase in petty thievery and crimes of a greater magnitude."

Fire Chief Thomas R. Murphy said:

"The present system of lighting on Market Street is the biggest insurance against fire that the high value property owner can possibly have. By taking out the 'Path of Gold' pedestrians will throng the better illuminated districts and still alarms will be reduced. That means that the fires will have gained a greater headway before the arrival of the fire apparatus and besides a darkened street tends to slow up the apparatus in driving to a fire."

Arrangements were made to continue the lighting of the "Path of Gold" until after the holiday season, and members of the Down Town Association have signified their willingness to sacrifice their time in order to assure the continuance of the present system of lighting Market Street.

### PLANS FOR AQUARIUM

Announcement is made by the Academy of Sciences, San Francisco, that the Aquarium for Golden Gate Park, provided for in the will of the late Ignatz Steinhart, is assured by the recent settlement of his estate. The entire amount of the legacy will be expended upon the construction and equipment of an aquarium building, which, it is believed, will be second to none in the world. Lewis P. Hobart has been appointed architect by the Academy board of trustees and Trygve Ronneberg engineer.

The new building, for which tentative plans have been drawn by Hobart, will be located just east of the Academy of Sciences building and across the way from the Memorial Museum.

Dr. Everman, director of the Academy of Sciences Museum, and Engineer Ronneberg will visit the aquariums at New York, Boston, Philadelphia, Washington, Detroit, and Chicago, and possibly the new one now under construction at Miami, Fla., where they will study the various technical matters of tanks, aeration, temperature control and analogous details connected with the proper construction and equipment of the Golden Gate Park aquarium.

Contracts will be let and building operations begun as soon as the plans have been definitely approved by the Park Commissioners, the Academy and the executors. This is expected to be within a few months.

### TRADE NOTES

#### Contract Awarded—

The contract for constructing the steel wireless tower at Keyport, Wash., has been awarded to the Foundation Company, L. C. Smith Building, Seattle.

#### New Store—

K. H. McGuinn, formerly with the Pacific Power and Light Co. at Astoria, has opened up a retail electric store at White Salmon, Wash. He has the agency for the Western Electric Farm Power and Light plants for Klickitat and Skamania Counties.

#### Distributor Appointed—

The Electric Maid Store in Portland have been appointed as one of the distributors of the Duplexalite.

#### New Installation—

The Siletz Lumber & Logging Company of Siletz, Oregon, has closed a contract with the Portland office of the Allis-Chalmers Manufacturing Company for complete saw-mill equipment, including all the motors for driving machinery, 1,000-kw. steam turbine condenser, injection pumps, etc.

The West Oregon Lumber Company have purchased a 2,000-kw. Allis-Chalmers Company steam turbine and generator, from the Spruce Division, for the mill at Linton. All

electrical installation work will be done by the West Coast Engineering Company.

The Puget Sound Navy Yard has placed an order with the Allis-Chalmers Manufacturing Company for three 1,000-kw. transformers.

#### Western Representative—

The Roller-Smith Company, 233 Broadway, New York, announces that its California representative, the Electrical Material Company, 589 Howard Street, San Francisco, has opened a Los Angeles office in the Title Insurance Building. The Los Angeles office is in charge of E. H. Bell, who has had extensive experience in marketing electrical products.

The Electric Material Company handles the Roller-Smith lines of electrical measuring instruments, watt-hour meters and circuit breakers in California, Nevada, and parts of Oregon and Idaho.

#### Underwriters' Approval—

On December 12 the full line of renewable fuses manufactured by the Economy Fuse & Manufacturing Company were officially approved for general use by the Underwriters Laboratories, Incorporated. It is said that the Economy Fuse & Manufacturing Company is to this date the only fuse manufacturer using the label service of the Underwriters.

#### New Coast Agency Arrangements—

Mr. J. G. Pomeroy announces that he has taken the Pacific Coast agencies for the McGill Manufacturing Co., manufacturers of wire guards, etc.; Edwards & Company, manufacturers of bells, push buttons, annunciators, etc.; Rome Wire Company, and the Illinois Wire & Cable Company. The product of these companies is well known throughout the United States and Mr. Pomeroy plans actively to push their sale on the Coast. He intends to devote special attention to the 660-watt pull chain sockets which the McGill Manufacturing Company has placed on the market.

#### Western Offices—

E. H. Bell, formerly with the Electrical Material Company at 589 Howard Street, San Francisco, has opened offices at 616 Title Insurance Building, Los Angeles, California, and will represent the Safety Insulated Wire and Cable Company. In our issue of December 1 this item was given incorrectly, Mr. Bell's name being spelled "Bill."

#### Branch Offices—

The Brokaw-Eden Company, Alton, Ill., which is carrying on an extensive national campaign for the Eden electric clothes washer, has established a branch office in the Gas & Electric Building, Denver, and has made James H. Diamond the advertising manager for that locality.

The Bluebird Electric Washing Machine Company is opening up a branch office in the Lewis Building, in Portland, Oregon.

#### New Business—

The Electrical Supply Company has recently opened business in Manteca, California, at 106 Maple Avenue. J. C. Kerr, formerly a member of the C. C. Severin Electric Company of San Francisco, is manager. The Electric Supply Company is already doing a brisk business in Westinghouse and Edison appliances.

#### Agent Appointed—

The Lapp Insulator Company, Inc., of Le Roy, N. Y., announce the appointment of the Capital Electric Company, Salt Lake City, Utah, as their representative for the Salt Lake district, and the Butte Electric Supply Company, Butte, Mont., for the state of Montana.

#### Power Company Valuation—

The Public Service Commission of Washington held a hearing at Chehalis, Washington, to establish the value of the North Coast Power Company's electric property in the Southwestern portion of the State. D. F. McCurrach, formerly chief engineer for the commission, made the valuation of the utility's property.

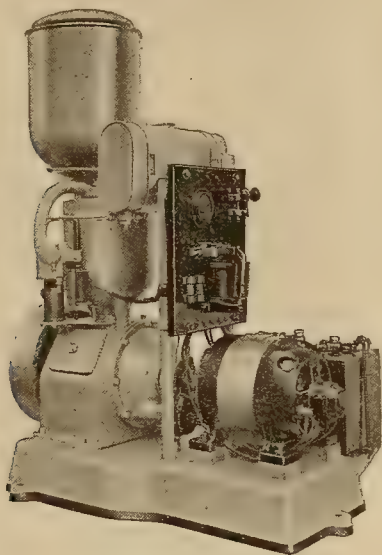


## LATEST IN EVERYTHING ELECTRICAL

(With the increased use of electricity in rural districts, a light and power plant such as that described here promises to be popular on farms. A series of specially designed lighting fixtures, particularly adapted to commercial use, is another item among recent electrical devices included here.—The Editor.)

### A PLANT FOR FARM LIGHTING

The Holt farm electric light and power plant, put on the market by the Automatic Light Company, Inc., of Luding-



An automatic power-light plant, simple to operate and specially designed for use on farms.

ton, Mich., consists of a 4-cycle valve in the head, water cooled, gasoline engine connected direct to a General Electric Company generator and a specially designed efficient electric starting device.

The engine is built for heavy duty, continuous service and dependability.

The crank shaft is counter-balanced and the whole machine is of best construction and perfectly balanced throughout.

The valves are of the valve in head type. The water cooling system is very simple, specially designed for this motor and extremely efficient.

The generator is of special design. One winding gives 110 volt current direct to the power appliances or lamps, the other winding is 6 volt and is connected with the self-starting device.

When a switch is turned in the house or barn the engine is automatically cranked, and the generator started in operation, supplying 110 volt current direct.

The starting battery is protected by an automatic switch, so that in event the owner failed to replenish the gasoline supply, the self-starter would operate only 30 seconds and then cut out, preventing the useless discharge of the battery.

The plant supplies sufficient power to operate thirty 25 watt lamps or several labor-saving power devices at the same time, 110 volt power carrying three times as far as 32 volt current such as is supplied by ordinary lighting plants with storage batteries in the lighting circuit.

The engine is controlled by a specially designed electric governor directly connected to the carburetor. In this way the voltage is maintained constantly and the light is without

flicker. When additional lamps are turned on, the governor opens the carburetor to take care of the additional load. With this automatic governor, gasoline consumption is proportionate to the load, thus making the machine very economical.

### COMMERCIAL FIXTURES

A series of commercial fixtures for use with the Ivanhoe Ace, Phoenix and other recently designed glass units employed in connection with high powered lamps, is announced by The F. W. Wakefield Brass Company of Vermilion Ohio.

Wakefield commercial fixtures are made wholly of brass, and as regularly shipped, include porcelain receptacles of special patented design built into the holders. They are entirely dust-proof and do not collect flies and moths.

Being packed one unit to the carton and plainly labeled, these fixtures are particularly convenient for the jobber and dealer to handle. The package need not be opened until the fixtures are on the job, thus there can be no possible loss of



This dust-proof fixture is made wholly of brass, and is especially adapted for use in stores, offices and public buildings.

parts, injury to finish or deterioration in stock.

The designs of the Wakefield commercial units, as indicated by the illustration, are such as to appeal to contractors and fixture dealers supplying equipment to the better class of stores, offices and public buildings.

### MECHANICAL HANDLING OF CARGOES

A well-prepared booklet under the above title has recently been sent out by the Wellman-Seaver-Morgan Company of Cleveland, Ohio, describing the dock cranes installed at the United States Army Supply Base, Boston. Features of the booklet are the very fine photographs with which it is illustrated.



## Books and Bulletins

### Ground Water Hydrology

Facts in regard to the water resources of the vicinity of San Diego, with a large amount of detailed data, are presented in a comprehensive water-supply paper entitled "Ground-water Resources of the Western Slope of San Diego County, Calif.," just published by the United States Geological Survey, Department of the Interior, as Water-Supply Paper 446. This paper, which contains large maps and numerous other illustrations, is the result of an investigation of the geology and water resources of the region made by the Geological Survey with financial assistance by the State of California and the city of San Diego. The investigation was made by Arthur J. Ellis and Charles H. Lee. Mr. Ellis is a geologist on the staff of the Geological Survey. Captain Lee, who has just returned from France, where he served in the water-supply section of the First Army of the American Expeditionary Forces throughout the St. Mihiel and Argonne offensives, is a California engineer of wide experience with ground-water problems in the West.

The portion of this report prepared by Charles H. Lee treats of the ground-water hydrology of the shallow water bearing formations of the Pacific Slope of San Diego County, California, and the utilization of ground water from these formations. Complete precipitation records at 106 stations are presented, together with a detailed map of the county, with lines of equal precipitation at 2-inch intervals. Interesting conclusions are drawn regarding the amount of rainfall in any season necessary to produce runoff and also the relation of rainfall to runoff. Evaporation observations are given and comparison made between evaporation from a pan floating on a large reservoir surface, and the reservoir surface itself, which indicate that there is little difference between the two.

Detailed physical descriptions are made of the ten largest underground reservoirs of the region lying in the principal river valleys, with numerous well logs, geologic sections, records of well fluctuation, ground water profiles, and estimates of average and safe yield based on the "water table" method. The tests of the yield of individual wells are also presented. The conclusion is drawn that ground water in the San Diego County river valleys has very little movement and seldom occurs as underground streams, but occupies underground reservoirs.

Similar data is also presented for underground reservoirs of the minor coastal plain and highland valleys, the sea terraces adjacent to San Diego Bay, and the decomposed granite areas of the highland.

Tests of existing pumping plants of various types are presented, which for working conditions on the farm, show pump and pumping plant efficiency and cost of pumping for irrigation. The selection and installation of pumping machinery is also discussed.

A copy of this paper can be obtained free of charge by writing to the Director, U. S. Geological Survey, Washington, D. C. The complete records of stream flows in the region are published in the Survey's Water-Supply Paper 447.

### Inductive Interference

In the course of its investigation, the Committee on Inductive Interference of the California Railroad Commission compiled a large number of technical reports on many phases of the subject. These reports were rendered to the California Railroad Commission and are on file in its archives. Owing

to the widespread interest among electro-technical and other engineers, the commission was asked to publish all or the most important of these reports and thus make them available for general distribution. This the commission has done and there is now just off the press and ready for distribution to subscribers and purchasers a large volume under the title of: "Inductive Interference Between Electric Power and Communication Circuits, Selected Technical Reports with Preliminary and final Reports of the Joint Committee on Inductive Interference, and Commission's General Order for Prevention or Mitigation of Such Interference."

This publication is of special interest to electrical engineers in all branches of engineering, particularly railway, power, telephone and telegraph companies, manufacturers of electrical apparatus, and to State and Federal regulatory bodies.

The volume, bound in morocco leather and including 1,060 pages, consists of the thirty most important technical reports of the Joint Committee on Inductive Interference, selected from the seventy-one which were issued from time to time during the investigation. It also includes the preliminary and final reports of the committee to the commission, and the General Order No. 52 of the commission prescribing rules and principles governing the construction and operation of power and communication lines for prevention and mitigation of inductive interference.

The book represents the results of extensive field and laboratory tests and investigations carried on for a period of over five years by a staff of electrical engineers from all parts of the United States, at an expense in excess of \$100,000, and represents the thought and study of some of the most prominent power and communication engineers of the country.

The work of the committee, the results of which are set forth in the volume, covered the field and laboratory tests of actual inductive interference, together with theoretical studies, between existing power and communication lines, transformer connection, loading, etc. Analyses were made of causes of inductive interference, magnitude, qualitative and quantitative effects under varying conditions, methods of prevention and mitigation of interference and special characteristics of the phenomena.

The book sets forth the extent and conditions of tests made, the results determined and the conclusions reached. The final report to the commission gives in summary form the results and recommendations relative to this most important subject of inductive interference, which is becoming of more vital importance to the electrical industry with the rapid development and extension of power and electric communication service.

### Business Books for New Year Gifts

So wide-spread has become the interest among the business-reading public in business literature that the A. W. Shaw Company, publishers of Shaw Standard Business Books, will this year conduct a New Year business book campaign.

There are business books that will meet practically all requirements. During recent years business book sales have rapidly increased. This latest development to organize the business for the holiday trade gives the business-reading public an opportunity to give and secure as gifts books of usable, money-making ideas.

### Safety Switches

Bulletin No. 3 on "Externally Operated Safety Switches" has just been issued by the Trumbull Electric Manufacturing Company. For the convenience of the user this bulletin has been reduced to pocket size, representing an exact duplication of such pages in the large Trumbull catalogue as are devoted to "Circle T Safety Switches." It includes many new additions to previous lists.



## NEW ELECTRICAL DEVELOPMENTS

(A considerable number of city improvements are under way in the Northwest, including plans for municipal power plants. In the Pacific Central district large sums in bonds are being voted for irrigation projects, while lighting systems are receiving considerable attention both in the Pacific Southwest and the Inter-Mountain district.—The Editor.)

### THE PACIFIC NORTHWEST

**REEDSPORT, ORE.**—The Reedsport Light & Power Company has increased the capital stock to \$25,000.

**WINLOCK, WASH.**—C. F. Cunningham has sold his interest in the Winlock Electric Supply Company.

**SEATTLE, WASH.**—The Superintendent of Public Utilities has been instructed by the city council to submit at once a recommendation for subways, elevated street railways and terminals in the business district.

**SEATTLE, WASH.**—Regents of the University of Washington have authorized the building of a conduit to connect the university buildings with the power house and the purchase of a 500-horsepower 2,200-volt generator and exciter.

**SEATTLE, WASH.**—The matter of double tracking about  $1\frac{1}{2}$  miles of the Alki-line of the municipal street railway system is being considered. Funds to make this improvement will be available from the proceeds of the sale of \$790,000 street railway improvement bonds.

**OLYMPIA, WASH.**—Sale of Seattle utility bonds aggregating \$2,040,000, of which \$1,250,000 is intended for development of the Skagit River power site. The face of the bonds fixed the interest rate at 5 per cent and they were sold at 92 cents on the dollar to Carstens & Earles and John E. Price & Co.

**OLYMPIA, WASH.**—Plans for the Snake River irrigation project, for which complete preliminary survey has been made by the State Reclamation Service during the past summer, call for irrigation of 60,000 acres in Franklin County, and 40,000 acres in Walla Walla County, by means of large pumps to be operated with power generated from the dam.

**SEATTLE, WASH.**—Mayor C. B. Fitzgerald, while in Washington, D. C., recently telegraphed his secretary that not only would the final permit for the city's Skagit River hydroelectric plant be forthcoming immediately, but that A. P. Davis, the chief engineer of the National Reclamation Service, had consented to come to Seattle to inspect the project and advise on the details of the enterprise.

**TACOMA, WASH.**—The Tacoma Railway & Power Company has given notice of an increase in street car fares to 10 cents beginning January 18. The new rate was filed with the State Public Service Commission together with a statement as to its necessity. It was declared that the present fare, 7 cents, does not bring in sufficient revenue to meet operating expenses and the condition of the system was pictured as being in a bad state.

**SEATTLE, WASH.**—Sealed proposals will be received at the office of the General Purchasing Agent for the Alaskan Engineering Commission, room 422, Bell Street Terminal, up to January 5, 1920, for furnishing free of all charges delivered on pier Mazda lamps, 500-50 watt; 200 lamps, 75 watt; 300 lamps, 100 watt; 100 lamps, 200 watt; condulets, conduit covers, porcelain, ten transformers, bell-ringing, Western Electric Company's No. 1; 10 pieces I-beam, 15 inches deep, 6 inches wide, three-fourths inch web.

**ROSEBURG, ORE.**—A crew of men under the direction of Floyd Frear, city engineer, left for Rock Creek to make preliminary surveys for the proposed municipal power plant, the erection of which will be decided by the voters of

the city early this year. At the council meeting the city officials having the work in hand were ordered to speed up their departments in order to make the municipal power and water plant the first item of business on the year's calendar. An ordinance authorizing the charter amendment is being drafted and as soon as the engineer can obtain accurate estimates a special election will be called.

**SEATTLE, WASH.**—In competition with firms throughout the United States, the Foundation Company of Portland and Seattle was awarded the contract for constructing the mammoth Keyport station on its bid of \$42,368. Keyport is located nineteen miles north of Bremerton and the station will be 400 feet in height. The contract was awarded by the United States Bureau of Yards and Docks, Washington, D. C. According to announcement the Foundation Company, of which Bayley Hopkins is vice-president, will begin work at once on the Keyport station, and will complete it within 180 days. The structure will be of steel construction, ninety feet in diameter at its base and five feet at the apex of the 400-foot tower. The contract also calls for the wiring of the station, but the government radio experts will install the radio apparatus.

### THE PACIFIC CENTRAL DISTRICT

**MADERA, CAL.**—The election for the formation of the Madera County Irrigation district has been called by the Board of Supervisors for January 2.

**SAN FRANCISCO, CAL.**—Architect Charles E. Perry, Jr., 1209 Sutter Street, Vallejo, has completed plans for a water supply and storage system for the Solano County Hospital.

**STOCKTON, CAL.**—Recent heavy rains have enabled the Western States Gas & Electric Company to shut down its steam plant and the company is now operating exclusively on hydro power.

**CHICO, CAL.**—Sealed bids will be received by the board of directors of the Paradise Irrigation district up till January 15, for the purchase of bonds of the district in the amount of \$140,000.

**HANFORD, CAL.**—A petition for the creation of an irrigation district to be known as Burrell Irrigation District has been filed with the Irrigation Board of the State of California.

**MERCED, CAL.**—Louis Titus, the San Francisco capitalist who purchased the Bloss ranch, contemplates the installation of four wells for irrigation, each to be equipped with a fifty horsepower electric motor.

**SALINAS, CAL.**—The Union Water Company, a new cooperative irrigation concern at Greenfield, has filed articles of incorporation in County Clerk Joy's office. The directors are Ernest Thayer, George B. Curtis, T. L. Rogers, George D. Hawley and Joseph Throp.

**SAN FRANCISCO, CAL.**—The Board of Supervisors adopted a resolution directing the clerk to advertise that sealed bids will be received by the board on January 5 for the purchase of \$29,220,000 water bonds of the city, issue of 1910. J. S. Dunnigan, clerk.

**WILLOWS, CAL.**—T. W. Harian, local ranchman and contractor, and Thomas Sayer have been awarded the contract for building the main canal and laterals of the new Mallon and Blevins irrigation project, which will water

10,000 acres of land in the vicinity of Williams, Colusa County.

**MARTINEZ, CAL.**—By a vote of 173 to 14 the Byron-Bethany Irrigation District organization election was carried. As a result of the election steps will be taken in the near future toward the construction of an irrigation system. A huge reservoir is to be constructed in the vicinity of Byron at a cost of \$20,000.

**VALLEJO, CAL.**—Orders have been received at the Navy Yard to proceed with the erection of a high-power radio station to be an auxiliary to the low-power station at Mare Island. The Pittsburgh Steel Company has the contract to supply and erect the poles. The entire cost of the station will approximate \$200,000.

**YREKA, CAL.**—The Board of Supervisors has granted a petition to form the Shasta Irrigation District, signed by eighty-four landowners, the district embracing 10,000 acres. The petitioners now will take the matter up with State authorities for approval before calling an election to vote bonds of \$600,000.

**WILLOWS, CAL.**—Incorporation papers of the Butte-Glenn Mutual Water Company were filed with the Secretary of State. The capital stock is \$28,000 and the directors are John Houk, of Santa Maria, and Ben E. Crouch and Ferdinand Cavassa, both of Chico. The proposed irrigation district includes lands in Glenn and Butte counties.

**MACDOEL, CAL.**—Macdoel realty business is looking up since irrigation of this part of Butte Valley seems to be assured, numerous transfers of both town and county property have been made and three deals for desirable business locations in town are being negotiated. It is planned to erect business houses, including a hardware and general merchandise store, barber shop and a poolroom.

**STOCKTON, CAL.**—Samuel Kahn, vice-president and general manager of the Western States Gas and Electric Company, presented a bid for the lighting of streets in the city for five years beginning January 9, 1920, at the council meeting. The bid was accepted and a resolution will be introduced to make the award. The contract will be executed within the time specified by law.

**TRANQUILLITY, CAL.**—At a special election held here bonds in the sum of \$260,000 for irrigation improvements carried, the vote being 83 for to 2 against. The money will be used for the construction of a new pumping plant, for the building of a canal, and for the construction of a water works plant for the city of Tranquillity. As soon as the legal matters can be attended to, work on the improvement will be started.

**MODESTO, CAL.**—Modesto voted \$289,000 in bonds for municipal improvements. The total issue asked was \$410,000. The bonds voted included street intersections, storm sewers, sanitary sewers, liquifying sewage tanks and water tanks. The items defeated were aviation grounds and fair grounds, Dry Creek Park, motorized street flushing equipment, city hall site and electroliner system to replace gas street lights. Less than 30 per cent of the vote was cast.

**MANTECA, CAL.**—The Manteca Board of Trustees passed a resolution instructing the city attorney and the city engineer to prepare data for the purpose of a bond issue soon to be made for public improvements in the city.



A lighting system for Yosemite Avenue and two blocks of the Hogan Road, a storm sewerage system and the widening of Yosemite Avenue are three of the propositions to be covered by this bond issue.

**FRESNO, CAL.**—An ambitious scheme for the agricultural development of a 27,000 acre tract on the West Side was unfolded to the County Board of Supervisors with the presentation of a petition for the formation of the James Irrigation District. The engineering plans for consummation of the irrigation project call for the development of two separate water supplies, the underground through the drilling and electrification of artesian wells and the use of the flood waters of the San Joaquin River as a secondary supply.

**CHICO, CAL.**—The enlargement of the Nevis dam of the Great Western Power Company, Lake Alamanor reservoir, Plumas County, which supplies the Western Canal Company with water, is contemplated as the result of demands for water made by Sacramento Valley farmers and rice growers. This is according to H. F. Cauthard, manager of the canal company, who states that the present demand for irrigation water will bring a widening of the canal lines of the company and raising of the Big Meadows dam.

**FRESNO, CAL.**—In order to use some of the natural gas, now going to waste in the newly discovered gas field in the Elk Hill oil territory of Kern County, for the generation of electricity to aid in coping with the power shortage existing throughout the San Joaquin Valley, A. G. Wishon, general manager of the San Joaquin Light & Power Corporation, announced the immediate expenditure of \$1,000,000 for the construction of an addition to its natural gas and oil burning steam plant in Bakersfield that will double the size of the present huge plant and double its electric output.

**SONORA, CAL.**—The committee appointed several months ago by the Sonora Farm Center to visit the San Francisco headquarters of the Sierra and San Francisco Power Company in order to come to some arrangement whereby the farmers in this county will have more adequate water supply, have returned much pleased with the outlook. They were given to understand that the proposed lease to the Pacific Gas & Electric Company would enlarge the facilities and equipment of the P. G. & E. and put it in a condition to make extensions and other improvements in addition.

**MODESTO, CAL.**—Petitions calling for a special election to vote \$2,000,000 in bonds for construction of the Don Pedro reservoir, a district power plant, distribution lines and for drainage purposes the form of which was presented to the directors of the Modesto Irrigation District by Attorney J. M. Walthall in adjourned session, were ordered printed under Walthall's supervision and placed in circulation at once. Attorney Walthall will supervise printing of the petitions which will be placed in circulation among the electors of the district for signatures and then presented to the board, which will set a date for the election.

**SAN FRANCISCO, CAL.**—J. R. Mason & Co., local specialists in irrigation and reclamation district bonds, were the successful bidders for \$50,000 Terra Bella Irrigation District 6s on their bid of a premium of \$940. Aronson & Co., Los Angeles, submitted the second best offer for these bonds of \$814 premium. The Terra Bella District has made remarkable progress and growth during the past twelve months. These bonds were sold by the district to finance the cost of extensions to the irrigation system in order to meet the demand for water from land which had heretofore been dry farmed. Mason & Co. expect to have these bonds ready to offer during the next few days at prices to yield full 5½ per cent interest, Federal income tax exempt.

**SACRAMENTO, CAL.**—Unable to reach a unanimous decision as to handling the \$1,800,000 Sacramento River filtration bond issue, the Sacramento Clearing House took no action at all. This is according to Secretary A. B. Carter of the Clearing House Association. Commissioner of Finance Gus S. Turner, to whom the City Commission referred the whole matter of floating the bond issue, appeared before the Clearing House asking to take the bond issue. It is understood a majority of the members favored a proposition of buying \$150,000 of the bonds at par January 1st, and taking an option for the purchase of the balance on July 1st. This was defeated, however, because unanimous action is required, and W. W. Bassett, cashier of the Capital National Bank, objected, saying the proposition was no different from that his bank had offered the city.

### THE PACIFIC SOUTHWEST

**ORANGE, CAL.**—A contract for the construction of an ornamental lighting system at Orange has been awarded to Joseph Pieb. The contract price is \$18,000.

**PRESCOTT, ARIZ.**—The State Miner at Wickensburg reports that flood waters tore out reservoir, washed away engine house, tank and machinery at the F. X. O'Brien ranch.

**COACHELLA, CAL.**—Louis B. Ferrill, of Pomona, has been awarded the contract for building a spreading dam in the Whitewater River wash near Palm Springs Station, at a price of \$15,865.60.

**LOS ANGELES, CAL.**—The San Pedro Home Telephone & Telegraph Company, the Santa Ana Home Telephone & Telegraph Company, and the Ventura Home Telephone & Telegraph Company have decreed dissolution.

**PASADENA, CAL.**—A resolution has been passed providing for the construction of 49 reinforced concrete lighting posts to be furnished and installed along Euclid Avenue, from the south line of Walnut to Center Street, etc.

**IMPERIAL, CAL.**—Building of the Thistle Canal has been authorized by the directors of Water Company No. 8. Specifications for construction will be prepared at once. The canal is to be about 15 ft. wide at the bottom. It will leave the Tamarack ranch about 5 miles north of Imperial.

**LOS BANOS, CAL.**—The bond election held in Los Banos for the purpose of voting bonds for purchasing and improving the city water works carried. The bonded indebtedness incurred will amount to \$103,000. The plant will be moved to a new location and among other numerous improvements will have a filter installation.

**PHOENIX, ARIZ.**—Construction work on the main canal of the Lyman dam near St. Johns will be resumed in the near future and bids for the continued construction of the dam will be called within the next week or ten days. Six contractors, all of St. Johns, entered bids for the construction of the main canal and for the cleaning thereof. Announcement of the award will be made later.

**LOS ANGELES, CAL.**—Two additional tracks between Anderson Street and Echandia Junction will be constructed by the Pacific Electric Company, to facilitate handling of passengers to and from Pasadena, Sierra Madre, Monrovia, etc., as announced by V. P. Titcomb. This is the first link in a general plan for better terminal facilities at 6th and Main Streets. The new viaduct will extend from the station to Aliso Street.

**SAN DIEGO, CAL.**—New plans announced by the Navy Department for San Diego cover an expenditure of approximately \$27,000,000, and include among other things a Naval Training Station, completion of the Marine base now under way, conversion of the shipbuilding plant into a Navy repair yard, a base for destroyers, Naval aviation and Naval hospital. Several mil-

lion dollars of the amount appropriated will be expended in 1920.

### THE INTER-MOUNTAIN DISTRICT

**RIGBY, IDA.**—This city has just granted the Utah Power & Light Company a fifty-year franchise for power and light service.

**SHELLEY, IDA.**—This city will soon receive electric service from the Ashton-St. Anthony Power Company, according to announcement made by the management of that company.

**DUBOIS, IDA.**—This city will shortly receive electric service from the Ashton-St. Anthony Power Company. The company promised to have service available December 24, for the proper observance of Christmas Eve.

**YERINGTON, NEV.**—A decree confirming the bond issue and all proceedings for the organization of the Walker River Irrigation District has been entered by Judge T. C. Hart here. The bond issue providing for the construction of a storage reservoir and irrigation ditches is for over \$900,000.

**IDAHO FALLS, IDA.**—City officials have appealed to the Utah Power & Light Company for additional power to take care of the city's requirements. The city municipal plant is having some difficulty giving service on account of the extremely cold weather with consequent trouble with ice and low water.

**PROVO, UTAH.**—The Utah Valley Gas & Coke Company is permitted, under an order of the Public Utilities Commission of Utah recently filed, to increase its rates for gas service to customers in Provo, Springville and Spanish Fork. The order grants even a larger increase than asked for by the company. The new schedule becomes effective December 20, 1919.

**OGDEN, UTAH.**—Application for the water power in the Targhee forest, near Idaho Falls, Idaho, was made at the District Forest Engineer's office in this city recently by N. P. Bean. About 3,000 horsepower is involved and the applicant intends running a transmission line from the power site along the Snake River to Ashton, Idaho. Permission has not yet been granted for the use of the water.

**BRUNEAU, IDA.**—A special election will be held on Jan. 10, 1920, in the Indian Cove irrigation District to issue bonds of the district in the sum of \$150,000. Said bonds, if authorized, or the proceeds thereof, shall be used for the purpose of acquiring title to the pumping plant, pipe lines, canals, water rights and irrigation system and for the completion of the said system of irrigation works now partially constructed.

**SALT LAKE CITY, UTAH.**—The Utah Power & Light Company has made application to the Public Utilities Commission for an increase in its rates for power, the present earnings of the company not being sufficient to pay an adequate return on the investment. No change will be asked in lighting or cooking rates. A continual rise in operating expenses is responsible for the petition, which is the first filed by the company.

**SALT LAKE CITY, UTAH.**—Prospects of increasing the scope of the famous "White Way" lighting of this city are very bright. A large number of prominent business men whose establishments are in the districts affected have petitioned the City Commission to establish a new district which will include the building of a system similar to the present Main Street lighting on State Street from South Temple Street to Sixth South Street, on Third South Street from West Temple to Fourth East Street, and on Fourth South Street from Main to State; a total addition to the present system of twelve blocks of white way lighting. When the new installation is completed Salt Lake City will be even more famous for its white way lighting, which has already attracted nation-wide attention.





Being frank with the consumer is one of the most recent policies advocated by the public utility, but judging by the following plaint, the consumer does not fully appreciate his privileges:

We are not exactly satisfied  
Concerning our gas bill  
And we registered a protest.  
The man in the gas office  
Was very pleasant about it  
And said he would attend to the  
Matter at once, which he did.  
He sent a man up to the house  
To read our meter and, meantime,  
Telephoned us to go down the cellar  
With the man and read the meter  
At the same time he read it  
So there would be no mistake.  
Well, the man got to the house  
And we followed instructions  
And went downstairs with him  
And he pulled out a book  
And took note of the meter  
And asked us to look at the meter  
With all its little dials.  
After we had looked at the thing,  
He marked down some figures  
And said, "Now is everything  
All right and O. K.?" And we said:  
"Surest thing you know."  
We don't know yet how he got the figures  
That he marked down in the book,  
All of which goes to show  
How a man will lie, as we did,  
Just to save his pride—also  
It goes to show  
That you can't skin a gas company.

\* \* \*

Ignorance is not always bliss, and sometimes it can be very expensive:

Last winter an Eastern gas company went into the pipe thawing business. They charged twenty dollars per thaw whether it took the gang two minutes or two hours to complete the job.

One day the gang were out at their work when they were accosted by a yiddish gentleman, who asked what they would charge to thaw a pipe for him. "Twenty dollars," replied the Irish foreman.

That was a lot of money to pay for a few minutes' work, thought the yiddisher, so he started an argument with the foreman, trying to reduce the rate, while the gang climbed a pole preparing to hook up their apparatus.

The foreman would stand for no reduction in the rate, but the customer continued talking and while he was still going the water started flowing.

"See," he said to the foreman, "I don't have to pay you now the water is running."

"Hey, what are you guys doing," yells the foreman at the gang on the pole. "This fellow never paid to have that pipe thawed. Reverse the current and freeze it up again."

"No, don't do that," begged the customer. "I'll pay you the twenty dollars."

\* \* \*

Omar Khayyam found a good many things to be sad about, but his Rubaiyat might have been twice as long if he had lived today. Except for the note of optimism at the end, which Omar would never have permitted, this may stand as the twentieth century's postscript to his famous utterances:

The dollar that we knew long years ago  
Full many an earthly blessing did bestow;  
That dollar now has dwindled till it seems  
A bagatelle, significant of woe.

Eggs have become a rarity with me,  
I've hocked my evening clothes to buy some tea,  
The phonograph I've longed for all these years  
Will never soothe me with its melody.

My winter's wood costs twenty bucks a cord,  
Each load makes incursions in my tiny hoard;  
Petrol long since has passed beyond my ken  
And I use distillate to run my Ford.

There is no succor from the wintry breeze  
As I must wear my chilly B. V. D's;  
I can't afford the long ones which would keep  
The circulation active round my knees.

But far away there is a spot of cheer,  
The money that we used to spend for beer  
Is being saved to cast a giant bell  
To sound the knell of every profiteer.

—Richard E. Smith.

\* \* \*

There is a story of a negro mammy who, when asked how she managed to raise her large family of boys to be so well-behaved, replied: "Ah'll tell yo'. Ah raise dem boys wid a barrel stave, an' Ah raise 'em frequent." Here we have the up-to-date barrel stave—the spanking machine—and one of the most recent recruits to the ranks of electrical household appliances. In large families it will doubtless be found a great labor-saver. It seems a pity it was not invented in the days of the much-harassed "Old Woman Who Lived in a Shoe."



Electricity in the home



# JOURNAL OF ELECTRICITY

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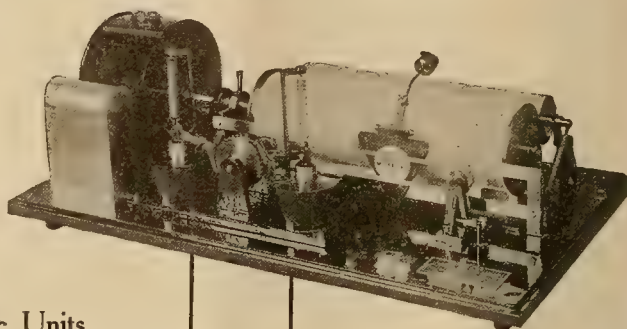


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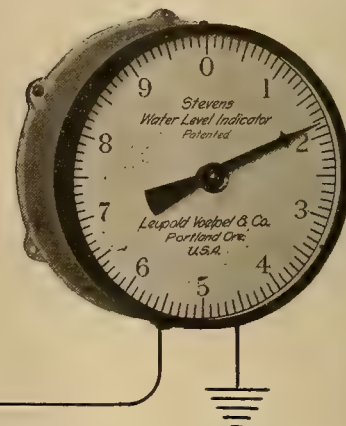
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# JOURNAL OF ELECTRICITY

FOUNDED 1897

ROBERT SIBLEY, Editor

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SAN FRANCISCO, JANUARY 15, 1920

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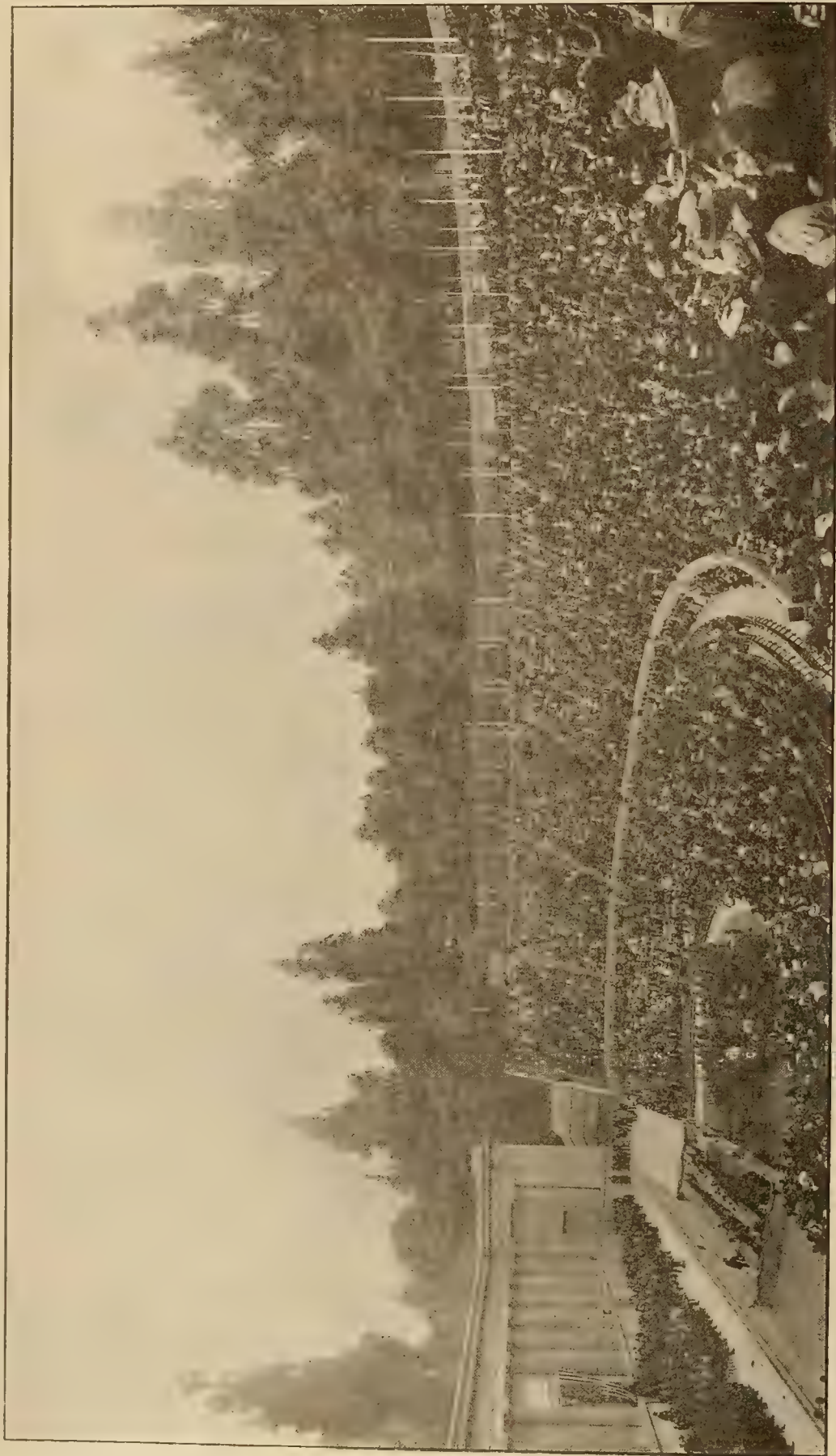
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### The Largest Enrollment of Any University in America is the Latest Record of the West to Be Recorded

**S**TATISTICS just compiled show that the University of California has passed Columbia and thus becomes the largest in America with its 9,685 regularly enrolled students as against 8,204 for Columbia. This growing strength of educational institutions in the West is of great timely interest to men of the electrical industry in that it is realized that the vast hydroelectric possibilities of this section of our country, which will unquestionably be developed on a hitherto undreamed-of scale in the near future, will require the best of commercial and technical skill in engineering that can be obtained. And the fact that the enrollment at the University of California shows 697

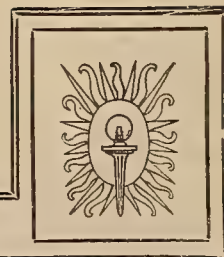
among electrical and mechanical engineers is again a source of great gratification.

The picture shown is that of the Greek Theatre, an open air structure which seats something over 12,000 people and which today occupies a unique position among American institutions. In this theatre have appeared such men of international standing as Theodore Roosevelt, President Wilson, President Taft, President McKinley, and a host of national and international men of letters, art and sciences, who have come from time to time to address audiences there.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, JANUARY 15, 1920

Number 2

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## TELL ONLY WHOLE TRUTHS

*This editorial is written in the nature of a frank warning to certain bonding houses and other institutions that handle securities for utility institutions of the West*

It is a common remark among men on the street and a source of the breeding of much ill-feeling and misconception among the public generally that certain hearings before utility commissions bring out facts of necessity in increases of rates, and then the very next thing that appears is a prospectus from a bonding house or a company handling utility securities setting forth an entirely different plea, or rather a more beautifully painted picture than the one that came before the railroad commission. As a consequence, when the investor and the consumer meet, it is needless to say that the utility commission, the utility and all those who have had anything to do with the transaction are unjustly and oftentimes unfairly criticised.

Today, in the West, there is no type of security that stands in better advantage as a wholesome, profitable investment than that of the duly authorized issues of utility companies throughout the West. The communities these institutions serve are growing at a rapid rate, their industrial and agricultural wealth is increasing by leaps and bounds, and the possibilities of ever-increasing strength in the way of further development of hydroelectric powers by each of the utility companies involved, will unquestionably place this class of security constantly in the most favored light.

Indeed, hydroelectric development can be shown and is being shown under the self-interest idea to be the prime factor upon which all other questions of community development must depend. The plasterer, the lumber man, the grocery man, the architect and, it might be said, all classes of industrial and commercial life may be shown to be dependent upon hydroelectric energy in the West, for electricity, due to its use in the pumping of water, is of prime importance in the development of this section of our country. Hence it is not necessary to have a picture which represents only half truths to induce the investor to place his money in these securities,

nor is it desirable; the plain, hard, staid facts brought out in the Commission hearing should be sufficient and are indeed sufficient to show these securities in their true and deserving light for investment.

The West has a wonderful background of attainment. It is now generally conceded that the notable engineering feats that have been accomplished in the West have set a new standard of vision and enthusiasm for national endeavor. This background of notable attainments has developed a group of men in the West who today are supplying the vision of engineering and commercial life in a manner not attained elsewhere in the nation. Operating under such vision, the dawn of the new tomorrow for utility life and growth in the West is of unusually high promise.

The Journal of Electricity is deeply appreciative of the splendid words of encouragement and confidence that continue to pour into its editorial headquarters from members of utility commissions, from engineers and operators engaged in municipal enterprises, and also from those who today, under private ownership, are building such splendid networks of accomplishment in the way of vast transmission lines of hydroelectric service in the West.

It will, as a consequence, be one of the ideals of the Journal of Electricity during coming months to see to it that any further departure from the telling of whole truths regarding security issues be given publicity in the columns of this Journal in order that the offenders may be known to the public generally and in order that the public may know that the great electrical industry in the West is basing its claim solely on the argument of self-interest and fairplay, asking only a reasonable return of money so that these great properties may go ahead under immediate development, in order that the West may come into its own by early development of the vast water-powers upon which it must lean so much for its future growth and in which it is so richly blessed.



The New Year has opened with a general tone of optimism in all lines of industry throughout the West. The strike situation in the shipyards, although still somewhat uncertain, is nevertheless progressing with reasonable accomplishment, the yards operating on the open shop principle. Foundrymen have entirely given in and gone back to work and machine shop men are contemplating doing likewise.

#### Business Situation Bettered

Business continues to be tied up in some quarters due to lack of deliveries. Demand in all lines of appliances continues to prove strong, but shortage of essentials is a drawback.

The Christmas holiday trade, electrically, exceeded all previous estimates. Portland central stations, for instance, report appliance sales in that district in excess of 30 per cent of the estimated volume, while in Los Angeles one dealer has recently received a solid train-load of 25 cars of electric washing machines, which indicates in a measure the great activity of that section along the line of electric appliances. It is believed that in the coming months those who have to do with the distribution of electric supplies and appliances will find greater and more far-reaching application for the trade. The domestic problem, which it is believed in the West has come to stay, is largely recognized as possible of solution only by the method electrical. As a consequence, those who have vision to look ahead see that the home in the future will be entirely remodeled. The kitchen, the living room, the dining room, the bedroom, and in fact all parts of the home will be remodeled in order to meet the requirements of electrical installation and appliances. Particularly will this be in cases where labor-saving devices may be installed. This will bring about added installation of wall receptacles, baseboard receptacles, and interior wiring of a more substantial nature and of such a nature that will convey heavier current than those hitherto thought desirable. Much study is being given on this problem and many of the local dealers are preparing plans and specifications to point out to the housewife the possibility of electrical saving in the homes, so far as labor is concerned. And whether the architect desires it or not, he will find that all installations of the future must conform to these demands of the hour.

A feature of the new year in the West is its strong financial status due to record-breaking returns from farm products and the growing industrial life of this section of our country during the past year, which has exceeded all previous records. This is reflected in the vast increases in banking power of Pacific Coast states. California state banks, for instance, have just passed the billion-dollar deposit line and their combined banking power is exceeded alone by New York state and Illinois, according to the state-bank Commissioner's report. This increasing financial strength will unquestionably have a very marked effect upon future security issues for utility com-

panies. Hitherto the West had always felt exceedingly dependent upon the older and more strongly entrenched financial centers of the East. It was only quite recently that an attempt was first made to sell securities to a local market, and the Pacific Gas & Electric Company has established an enviable record in this regard wherein an entire issue has been placed in California, so that citizens of this state today possess more of this particular type of investment than any other security in this state, with the exception of the various Liberty Loan issues of the National Government.

This is only an instance of what will follow time and time again in future placing of securities, and it is indeed a source of gratification in the West that such achievement has proven possible. And the fact that the financial and banking institutions of the West are expanding and becoming of ever-increasingly greater strength in deposits is a matter of great timely importance to the West.

A number of unusually interesting and instructive articles have appeared recently in the popular press regarding the compensation received by office employes, among which the engineers and other technicians of utility companies should be classed. The authors of these have given statistics showing that in general throughout the country the compensation of employes of this nature has not risen, either in proportion to the increase in the cost of living, nor even in proportion to the increase in the compensation of the less highly trained, and therefore, supposedly, less valuable employes.

This is a state of affairs which must be remedied without delay, as there is a growing tendency among such employes to leave their present employment and enter other fields where the pay is more in keeping with the value returned. Without the necessary personnel among the engineering force to supply the directing brains, the machinery of the plant will be only so much inert material and when the circumstances permit such employes to once leave the service, it will be difficult to get them back into the organizations.

In the West there is neither excuse nor justification for public utility companies to keep the pay of their engineers down below what is right and reasonable. It is a principle recognized by utility commissions of the West—notably the California State Railway Commission—that the rates to be charged for service are, or should be, based on the cost of delivering such service. This being the case, the compensation of employes should be in proportion to the cost of technical brains and skill required to perform this service within the organization, and the Commission requested to set rates accordingly. As it stands at the present time, the employes of these companies are paying out of their own pockets for a part of that which the consumer, subscriber or user obtains.

The West has built up a magnificent service in utility ideal and attainment, and the splendid engi-



neers and technical staffs of these organizations should not be allowed to drift into other channels of industry just at a time when hydroelectric development seems possible of usefulness and helpfulness to the public in a degree hitherto undreamed-of as possible of achievement.

The probable early passage of the water power bill calls attention again to the advisability of uniting all engineering work under one department in the cabinet. A bill to this effect which would transfer all work of an engineering nature to the Department of the Interior, changing its name to the Department of Public Works, has been recommended by engineers and architects alike and has been introduced before the House of Representatives. Because it is felt, however, that the public should be more generally educated as to the necessity for such a measure, those interested have urged that the bill remain in committee until wider publicity be given the movement.

The step is one wholly in the interest of efficiency and uniformity in the great public works carried on by the federal government and an advancement in which engineers of all branches are vitally interested. With the exception of this country and England, every large nation has some unified and constructive control of its public work. The chief obstacle in the way of the change is the inertia of existing conditions—and the fact that the importance of thus coordinating all public works is not generally recognized by the public. It becomes the especial duty of engineers and engineering bodies to overcome this second difficulty and prepare the way for the reorganization of the cabinet with the coming congress.

At the outset of the extensive advertising campaign being conducted by the united electrical industry in the newspapers of the West, a question of great importance presents itself as to the attendant publicity which will undoubtedly come to the industry in the news columns of the papers. Shall the publicity be massed in one section of the newspaper, or shall it be scattered?

If the electrical interests follow the lead of the automobile concerns in this regard, they will have those items pertaining to the industry grouped together in special pages and sections. If this policy be carried through, no doubt we shall soon see large "Electrical Sections," containing both electrical news and advertising, in the Sunday editions of our leading metropolitan journals. On the other hand, there are many men in the electrical cooperative movement who consider that the publicity material would

be more truly effective with the general public if it were distributed liberally throughout the news columns. Thus, they contend, the appearance of "canned information" and "publicity puffs" would be avoided, and the casual reader would have no such opportunity to deliberately "skip" the electrical items altogether as he would have if they were strictly localized in one part of the paper.

This vital matter needs discussion now, while the cooperative advertising campaign is comparatively in its formative period. The electrical industry must be prepared to profit by the experiences of others in similar endeavor, and should be broad enough boldly to improve upon their methods if it can.

The recent decision of the United States Supreme Court wherein pipe-lines for transmitting crude petroleum have been held to be common carriers, and as a consequence public utilities, is a matter of great current interest in the West, where crude petroleum is used to a considerable extent in the development of steam electric power. In California during the past year over 100 million barrels of oil valued at \$135,000,000 have been marketed. In order to get this commodity to the seacoast points, a number of pipe-lines, some of them considerably over 100 miles in length, have been instituted from the oilfields to the points from where the oil is desired to be shipped, and it is found that this manner of transportation not only presents an easy method of accomplishing the result thus desired but also proves unusually economical.

Since the utility life of the West is so closely inter-related with the economic mining and marketing of crude petroleum, the decision of the United States Supreme Court will be welcomed widely among utility circles. This interest will also be reflected in eastern centers, for the recent strike among the coal workers has led many utility operators to contemplate seriously the installation of fuel oil, due to the easy access of Atlantic Coast and Gulf seaport points to crude petroleum shipped up from Mexican oil centers. In view of this interest, engineers generally have already begun to contemplate seriously the advisability of installing pipe-lines from Atlantic Coast and Gulf points up to the inland centers for possible use in the distribution of fuel oil to big consumers.

The article by H. W. Crozier which appeared in the columns of the Journal of Electricity Jan. 1, 1920, is to be followed in our next issue by a concluding discussion of the technical details involved in oil-line transmission. This article is receiving wide comment among engineers and it is believed that Mr. Crozier has set forth unusually helpful and timely methods of computation for pipe-line distribution of this character.

IN THE NEXT ISSUE  
Electrical Opportunities in Marine Applications





A part of the open market, showing some of the offices on the left, the produce buildings on the right and two six-story buildings in the background. The floor space of the present buildings totals over 300 acres. The automatic clock can be seen to the left of the center.

## Electricity in Food Distribution

BY CARL M. HEINTZ

(Electricity is a familiar factor in food-production in California, on account of its vital connection with irrigation. Another phase of its contribution to the most important of California's industries is brought out in the following account of its use in food-distribution. The author is promotion representative of the Westinghouse Electric & Manufacturing Company in Los Angeles.—The Editor.)



The automatic electric clock which winds itself, lights itself up and turns itself out. It stands about 45 feet high and is located in the center of the main market.

EW people realize that one of the largest and most efficient food distribution terminals in the world, only surpassed in size by the Bush terminals of New York, is located in Los Angeles, California. From here millions of dollars' worth of goods are distributed annually to all points of the globe, and the terminal acts also as the center for the great fruit and vegetable industry of Southern California.

The floor space of the present buildings totals over 300 acres, which are divided among produce and manufacturing companies.

### Description of Buildings —

The two six-story buildings of class "A" construction, solid concrete, have recently been erected. These buildings will be devoted exclusively to manufacturers of food products and their store rooms. Two buildings, both approximately 625 feet long, with basement and two stories, are devoted exclu-

sively to the distribution of fruit and vegetables. The office building, measuring 1500 feet long, contains one acre of up-to-date offices for the various branches of the produce industry.

### Electric Freight Haulage —

Electricity from the beginning has played a very important part in developing the efficiency and speeding up the distribution of this terminal. All freight to and from the terminal is hauled electrically by the Pacific Electric Railway. Freight spurs run the complete length of the buildings and last year over 12,000 cars were loaded and unloaded—over 32 cars a day. Electricity was found to be the most efficient and inexpensive means of handling this situation.

A great deal of the loading and unloading is done at night. In fact, the market is busy 365 nights out of the year, distributing fruit and vegetables for the next day's trade throughout Southern California.

### Illuminating the Market —

Electricity has been used to the height of its efficiency in producing sufficient light to carry on this night work.

Flood lights are used extensively in lighting the streets where the freight spurs are run, and at present 25 flood lights, 500-watt capacity, are being used for this purpose. They are mounted on the side of the six-story buildings and make the whole street practically as light as day. The outside mar-

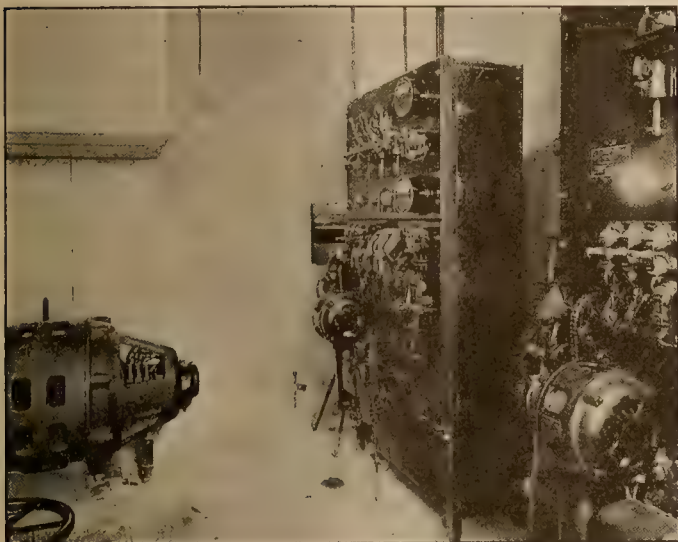


ket is lighted by 40 lamp posts, each with two 500-watt lamps, making it a very simple matter to load and unload trucks at night.

#### The Elevator Equipment —

One of the most complete and up-to-date installations of elevators in this country is to be found in the Terminal Warehouse buildings. Forty-seven elevators of the latest type are arranged throughout the buildings to obtain the utmost efficiency, the elevators being conveniently located near the freight spurs. A car can be unloaded, the produce trucked directly into the elevator and speedily elevated to any desired floor.

All the elevators are built for freight service with platforms varying in size from 10 x 28 feet,



Electrical equipment used on fire protection pumps. Two 75-hp. motors keep the water pressure for the sprinkler system constant between 95 and 120 pounds.

down. The capacity of the elevators, which varies from 2,000 to 20,000 pounds, with a speed range of from 50 feet to 150 feet a minute, allows the heaviest loaded truck to drive on the platform and be elevated to any desired floor to be unloaded, thus eliminating the double handling of the produce.

#### Different Types of Elevators —

Eleven of the elevators are of the hydraulic direct lift type, power being supplied from a central pumping station in the engine room. Thirty-six are electrically driven by direct connected motors operating on a 440-volt, a.c., 3-phase, 50-cycle current.

A feature of the elevator equipment is the development of two dumb waiters, which involves a special design including new and interesting control features. These dumb waiters provide what is known as full selective service to all floors. An operator at any landing can, providing the hatchway doors are all closed, bring the car to his landing or send it automatically to any other landing by means of a simple mechanical arrangement of cams and levers.

The total horsepower required to drive this battery of elevators totals over 600 hp. The heavy service motors are of the slip ring type and the light service motors are high torque squirrel cage induction motors especially built for this service.

#### Fire Protection —

Two 75-hp. motors keep the water pressure for the sprinkler system constant between a minimum of 95 pounds and a maximum of 120 pounds. When the pressure drops below 95 pounds, a pressure switch starts a small motor, which automatically throws in the 75-hp. motors.

A small jockey pump, driven by a 1½-hp. motor, is located in the pit with the pumping equipment and works automatically on a float switch, pumping out the water in case the pit is flooded by a broken pipe.

#### The Electric Clock —

In the center of the main market stands a majestic clock some 45 feet high, costing in the neighborhood of \$6,000. The clock is completely controlled and operated electrically. It automatically winds itself, lights itself at sundown and turns itself out at daylight, as well as performing many other duties unusual to the ordinary clock. It works directly from a storage battery to secure more constant voltage regulation. The owners of the clock are planning in the near future to run wires to all the large companies and supply them with the correct time.

#### The Refrigeration Plant —

One of the most interesting features of the market is its refrigeration plant. The two compressors are driven by one 100-hp. and one 150-hp. motor.

At the present time cold storage space is sold to the various produce companies; however, it is intended at some future date to lay pipes to all the larger produce companies and let them store their own fruit and vegetables in their basements.

#### Electricity in the Manufacture of Food —

This description only briefly covers electricity as it is applied to the actual handling of the goods. The manufacturing companies use electricity very extensively and some ingenious machines have been devised to handle the manufacture of their products.

One electrically driven machine, installed by Bishop & Company, conveys ginger snap dough from the electrically driven mixer, automatically rolls it out to the proper thickness, cuts out the ginger snaps, rolls and recuts the scraps, and then conveys the ginger snaps to trays where attendants handle them for the first time and place them in the bake ovens.

The H. Jevne Company have recently installed six electric bake ovens of 80-kw. capacity each, in which they will bake all their cookies, crackers, bread and rolls. This is one of the largest bake oven installations in Southern California, and its efficient operation will undoubtedly have a great effect in changing many ovens over to the more efficient heat.

The Los Angeles Terminal Warehouse Company have made a complete success of their terminal, and this was largely made possible through the efficient use of electricity in its operation.



# Technical Education Through University Extension

BY ROY J. HEFFNER

(Development in engineering fields of recent years has created an unprecedented demand for technical men. No better example can be given of the way in which educational institutions have come forward to meet this need than the Extension Division of the University of California. The author is head of the Technical Division of the University Extension work.—The Editor.)

The University of California has adopted a new policy in giving technical instruction by correspondence and extension classes. The features of the plan will undoubtedly interest persons affiliated with engineering industry on the Pacific Coast. In order that the University's aims may be fully appreciated, a brief explanation is opportune.

## Development of the Extension Division

Since the establishment of the University Extension Division the demand for extramural instruction has grown by leaps and bounds. Constant effort has been necessary on the part of its officers and faculty to keep pace with the needs of the people. Confronted by a shortage in funds available and by many problems of pedagogical nature, the division has been forced to consider only such demands as were most urgent.

A system of technical instruction based on meeting urgent demands only, can be easily imagined. The Technical Department has grown in many directions, but co-ordination and organization of its instruction have been very difficult. There have been no outlined curricula, and it has been almost impossible to arrange a logical sequence of subject matter in various courses. Technical instruction up to the present time, therefore, has consisted primarily of a collection of courses, each designed to meet a particular requirement; but not in general capable of being grouped according to definitely outlined plans for training in any one line. Most of the instruction has been of elementary and vocational character. Persons who have desired scientific or engineering education have attempted to fulfil their wants from this collection of courses according to their own ideas of proper methods. Such degree of freedom in the selection of subjects to be studied has tended to produce the same results as might be observed if all engineering freshmen were invited to take their respective choices of the courses offered in the institution.

## Features of the New Policy

After an extended study of demands which have been steadily increasing for the past few years, and of possible means by which they might be met, the following plan for technical instruction has been adopted, and is announced to take effect at an early date: All technical courses are now to be classified under the following headings: (1) Secondary, (2) Collegiate, (3) Professional, (4) Vocational. This classification may be explained as follows:

"Secondary" courses are those of high school grade which are to be studied preparatory to further instruction of college grade and also in certain cases preparatory to vocational instruction. Subjects coming under this class are algebra, geometry, trigonometry, physics, chemistry and geometrical drawing.

"Collegiate" courses are those giving as much as possible of the scientific and technical training now offered to resident students in the various engineering colleges of the University. Instruction in these courses is to be of the same standard as that of the regular University courses and will as nearly as possible duplicate the latter. It must be understood, however, that the instruction so given cannot be made as comprehensive as that obtained in residence at the University because of the many difficulties surrounding the teaching of technical subjects in places other than those which are especially equipped for the purpose, such as the University class rooms and laboratories. Authorities of the University, realizing the difficulties of extension teaching, have been doubtful of the success of such an undertaking. Now, however, it has been decided that technical instruction by extension should be carried as far as possible, in the belief that even though some phases may not prove at present capable of presentation, it is better to offer some instruction than none at all.

## Plans of the Technical Department

Education of college grade by extension methods is now to be undertaken, the first step in the plan being the establishment of correspondence courses in machine design, automobiles, heat power engineering, electricity, surveying, materials of construction, mineralogy, geology, crystallography, mathematics, drawing, etc. Plans are also under discussion with the University authorities for the establishment of courses in physics and chemistry. As soon as satisfactory progress has been made in these elementary courses, it is planned to proceed with advanced engineering courses.

Phases of this work which involve extensive laboratory practice are difficult to adapt to correspondence instruction, as has been mentioned. Partially to overcome such problems, it is planned to provide traveling laboratory equipment to be loaned to students and to be returned upon completion of the course. This method will be adopted in certain cases to be announced in detail later.

The Technical Department of the Extension Division in presenting instruction of college grade aims to offer as nearly the equivalent of a college education as can be given outside of a university, and to assure its students that members of the regular University faculty are preparing and supervising the courses so offered. Thus it aims, through its collegiate courses, to help three classes of people: (1) those who cannot come to college; (2) those who hope to come at a later date, but wish to make progress in the meantime; (3) those who have had some college training and who wish to carry it farther, though no longer in residence at the University.



It is hoped that eventually all work of secondary and college grade done through the Extension Division will be accepted for credit in the University, subject to such requirements as may be then stated. This, however, is a problem which cannot be definitely settled at the present time.

### Professional and Vocational Courses

"Professional" courses are to cover highly technical instruction in advanced engineering and scientific subjects; such as aeronautics, electrical engineering, radio communication and many others. These courses will be planned for technically trained persons desiring further knowledge in their own or in associated fields of learning. This type of instruction probably will not be available until after the satisfactory establishment of the more elementary kinds.

"Vocational" courses are designed to meet the requirements of practical men who, while not desiring to spend the time necessary to secure college training or to take a lengthy course in any one field, wish to obtain information which will help them in their work. This service is offered not only to individuals but to organizations. Officials of business enterprises throughout the West are invited to communicate with the Technical Department of the Extension Division in order that arrangements may be discussed for the education of their employes along lines of value to their respective industries. Such vocational education must necessarily be restricted to subjects of general and fundamental character. Instruction of extremely specialized or detailed nature is not feasible.

Subjects in which vocational courses are to be offered are automobile, tractors, shop work, mechanical drawing and blue print reading, elementary surveying, chemistry, electricity, hydraulics, mathematics, telephony, materials of construction, ship building, and others for which a demand may occur.

### Grouping of Courses

Under the new plan, technical instruction in the Extension Division will be offered by means of groups of courses which have been so prepared as to follow each other in natural sequence and to afford systematic training. It is necessary that prospective students realize the amount of time and study required to acquire knowledge which is thorough and not superficial. Short courses, given separately and without sufficient preparation on the part of the student, lead to limited knowledge which, as a rule, is of little value. The foundation must be strong enough to support the building to be constructed upon it. In order that education may be thorough, it is necessary that fundamentals be studied before undertaking advanced work.

For subjects of college grade these groups will include all topics necessary to a thorough understanding of the study being undertaken, and will include both secondary and collegiate courses. Students possessing preparatory technical knowledge may begin their work at any stage of the group at which they may be qualified to enter. Vocational courses will be grouped in similar manner. Such groups will, in many cases, include fundamental

courses of secondary grade in order that the student may obtain firm grasp upon the vocational instruction which is to follow.

### Correspondence and Class Instruction

Extension courses in technical subjects are to be prepared for correspondence study. Should there exist in any locality a sufficient number of people to warrant the establishment of a class in any subject or group of subjects, and should it be possible to secure a suitable instructor for such subjects, class instruction may be employed. It may also be possible to institute the "group study" plan, which consists of periodical class room meetings of correspondence students in a certain locality, at which time the instructor in charge of the course personally supervises and directs their individual work.

Technical courses are to consist of from ten to thirty assignments, for correspondence or class, as the case may be. Where text books are used, supplementary material and questions to be answered are sent out in mimeographed form from the University. In cases where technical instruction is offered through the media of leading periodicals in engineering fields, the periodical in question is used as a text, supplemented by material and questions in mimeographed form.

The Lecture Bureau of the Extension Division includes among its offerings lectures on technical and scientific subjects by authorities in the various fields. It is generally possible to secure desired lectures on certain subjects in any locality by communicating with the Lecture Bureau of the Extension Division at the University in Berkeley. Each application is individually considered and satisfactory arrangement agreed upon.

### Cost of Instruction

The charges made for extension instruction are at the absolute minimum. The division is not operated upon a profit making basis. Fees are utilized to cover the difference between operating expenses and funds available. Laboratory fees pay for such materials as are consumed and insure the University against loss or damage to equipment. Charges for the new technical courses to be offered will vary in amount, according to the character of the instruction, length of courses, etc.

All persons interested in any phase of the instruction mentioned are urged to communicate with the Technical Department, Extension Division, University of California, Berkeley, California, or with any of the following branch offices:

301 California Hall .....	Berkeley
140 Kearny Street .....	San Francisco
628 Metropolitan Building .....	Los Angeles
809 Farmers & Merchants Bank Bldg.....	Stockton
San Diego Public Library .....	San Diego

As fast as the new courses are ready, complete and detailed announcements concerning them will be issued to persons whose addresses are on file, and will be given as much publicity as possible.

The plans announced by the Technical Department mark a new stage in such instruction. The co-operation of all interested is needed to secure the success of the undertaking.



## That the People May Know

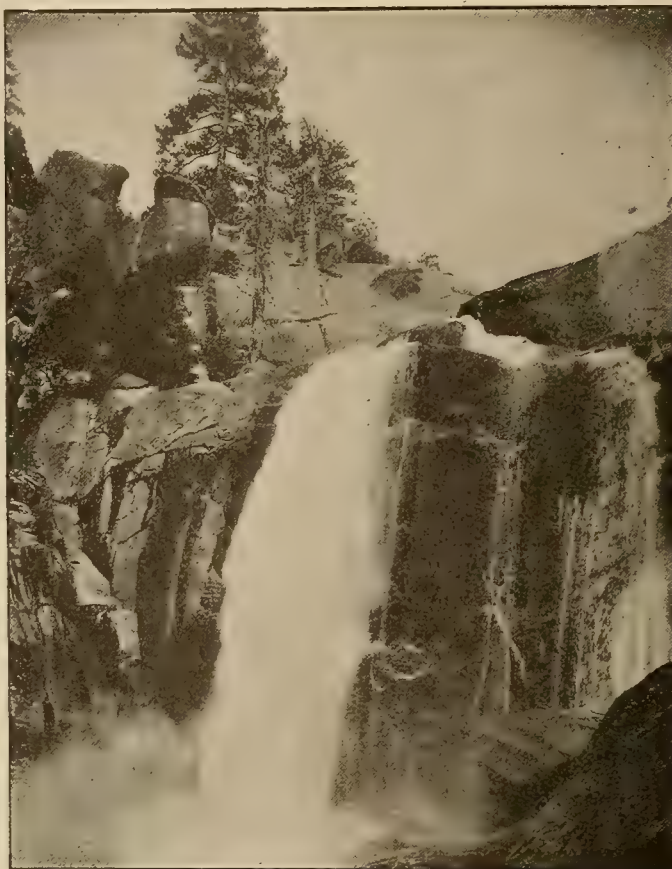
BY S. M. KENNEDY

(The public utility has nothing to conceal and it is to its own advantage that the public should be informed as fully as possible about its undertakings, its ideals, and its service. How to do this through the newspaper is here described by the general agent of the Southern California Edison Company in the sixth of a series of articles on public utility practice.—The Editor)

In no detail of the management of a modern utility company has there been a more striking "right about face" change during recent years, than in the matter of informing the public. It is not so long ago that the public policy of most companies was to tell the public nothing. All matters concerning a company's plans and operations were kept secret, and if a corporation were attacked, no matter how viciously, no comment was made or defense set up, the theory being that if let alone the attackers would wear themselves out. Naturally the public stood by and wondered. The people wanted the truth, but had no way of obtaining it—and most frequently were compelled to believe what was said against a company because the charges that were made went uncontradicted. Such a policy if indefinitely continued is nothing short of suicidal. It is worthy of note that most managers have dropped the old methods of secrecy and are gradually taking up with the new policy of publicity. It was Emerson who said "Trust men and they will be true to you," and in order to demonstrate to a man that he is trusted, you must take him into your confidence.

Now there are several ways of informing the public as to the aims and operations of a utility company—but, after all, the principal means is through the newspapers published in the territory in which a company supplies service. It is safe to say that the one publicity medium which has become an absolute necessity to modern civilization is the daily newspaper. The columns of newspapers are reserved for two purposes by their owners, namely, news and advertising. The newspaper's income is derived from its advertising, but the public buys it because of the news it is expected to contain. Advertising space is a valuable commodity which a newspaper sells, and upon which it pays its expenses and makes its profit. A public utility company should be a liberal advertiser, be-

cause of the benefits it will derive from attracting attention to the advantages of using the commodity in which the utility is directly interested. A public utility company has also much of importance to report concerning which the public should be informed, and which is distinctly news, and should be published in the news columns of the daily papers. Practically every newspaper subscriber is a consumer of electricity, and it follows in natural sequence that



The harnessing of the country's waterfalls vitally concerns the public and they should be kept in touch with new enterprises.

all consumers and subscribers are very vitally interested in everything pertaining to the service supplied, and in the company which takes care of their necessities. When allotting advertising and distributing news items the utility company cannot afford to ignore the small dailies in favor of the larger papers published locally or in neighboring cities, even though the larger papers claim a substantial circulation in the smaller communities. In an exhaustive analysis of the newspaper situation the "Editor and Publisher" of New York, a recognized authority in the newspaper world, points out that the big metropolitan papers can never serve as a satisfactory substitute for the close local appeal of the home dailies. It says:

"The considerations which render the local daily newspaper an essential factor in the life of its community, serve to make its advertising space an essential factor in any campaign of localized national advertising. Such newspapers are a part of the routine of life in their cities. They deal with near-at-hand concerns and people and affairs." Consequently in order "That the People May Know," the columns of all newspapers, big and little, having a circulation in a community, should be utilized by the company having advertising to allot or a story to tell.

What is it then that the people should know? A well known writer once said, "The public wishes itself to be managed like a woman; one must say



nothing to it except what it likes to hear." Experience does not indicate that such is the attitude of the public today—what it seems to want is the news, and above all it wants the facts. Far better for a utility company to stick to the old policy of secrecy about its affairs, than to hand out perverted news and stories containing half truths. Sooner or later the whole truth will come out, and then the company that has been side-stepping will be discredited, and later even the actual truth when published about



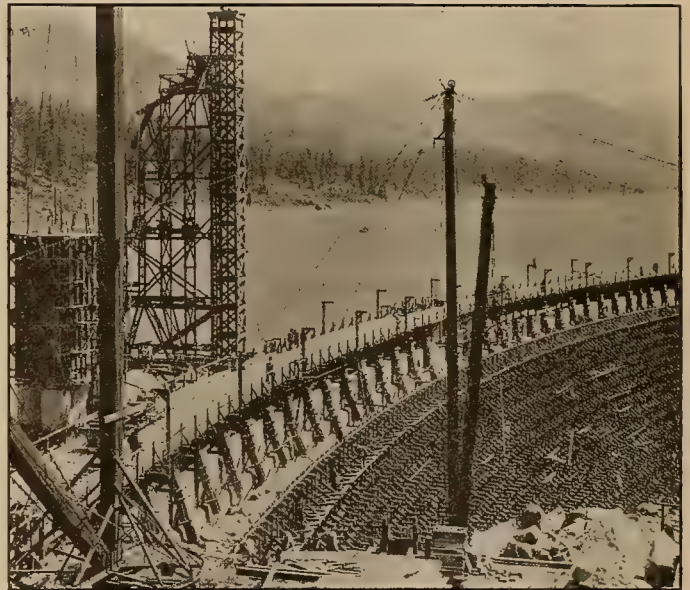
Power generated by fuels implies a drain on natural resources but hydro-electric energy is the essence of conservation.

other matters will be dubiously received. There is so much of interest and educational value that a utility company may tell, and repeat at intervals, that it would be practically impossible to enumerate all subjects. However, it may be desirable to touch on some of the more important.

#### Financial News

Not long ago a retired business man living in New York received a circular from a bond house announcing that a certain California power company was floating a new issue of its bonds amounting to sixteen million dollars. The circular was of the usual character setting forth the company's financial position and earning power. The New York man had a relative connected with the power company, and as he was interested in the issue, wrote asking for first hand information. He particularly desired to know, when he wrote making inquiries, how it was possible "for a company to be so remarkably prosperous and yet be so darned hard up." It is fair to assume that the average man of affairs, not connected with the public utility business, knows little about the methods of financing such a property, and the fact that under regulation the amount of a utility's earnings are limited to a relatively small percentage of the actual money invested in the property. While interest and sinking fund charges are taken care of, and a proper depreciation allowance is recognized, all expenditures for additions, and betterments must be made from funds derived from

sources outside the company itself. A utility company, supplying service in a prosperous community, cannot stand still—it must grow—and consequently must always be adding to its capital account. But capital is sensitive and will only go where there is confidence—and confidence is founded upon knowledge. Such being the case, it is surely desirable to inform the public regarding all matters pertaining to the operation of a utility company in its relations with its employees, its service to consumers, and its intercourse with the people in the territory occupied. There are no secrets that a properly operated utility need attempt to conceal. The cards may all be turned face upwards—the doors left wide open, and the books made available for inspection. At such times as a company may be offering its securities for sale, there are splendid opportunities for real news stories which the press will readily accept. What has been accomplished in the past may be attractively presented, and what the company proposes to do with additional capital in the way of substantial development may be set forth truthfully and attractively. The trouble is that many utility managers, though not belonging to the old secretive



When the people buy public utility bonds they should be informed how the money will be spent in driving long tunnels and constructing high dams.

class, assume the public knows much that it has no means of learning—unless the utility company itself sees that the desired information is wisely spread through all available channels.

#### Power Development

That the People May Know something concerning the difficulties of production of the commodity distributed, it is well to make public, through the columns of the newspapers, all stories concerning the building of new hydroelectric properties, including their location, cost, period required for construction, transmission difficulties, and all details connected with the work of wresting the energy from the waterfall and delivering it at some point of use, maybe hundreds of miles distant. The public should be informed under what conditions the company is



allowed to harness the falling water at each new development, and what the work means along the lines of conservation. That if the energy in the mountain stream is not utilized, it is a loss which cannot be made up in other ways, for after the water has once passed the fall, it has gone forever. On the other hand, if harnessed it becomes a perpetual asset, available for present and future generations. The power developed by means of coal or fuel oil, carries a different story. For every ton of coal or barrel of oil taken from the ground, there is just that much less to be drawn upon. Steam generated energy means the using up of the country's resources, while hydroelectric energy is the essence of conservation. These are the facts which may be woven into fascinating news stories, and to many people they will read like fairy tales. Let us assume a great corporation calls for a loan of ten or fifteen or twenty millions of dollars for the development of some giant power project and the funds are made available. Most likely the work will be carried on in almost inaccessible mountain fastnesses. The money will be spent in driving long tunnels and constructing high dams, and millions will be distributed for labor in the employment of thousands of men for many months at a time. Fortunes will be invested in machinery and equipment and the desired end will be attained only after years of almost endless toil and patient waiting. Surely these are things which must be of interest to present and prospective bond holders and stockholders and the general public. But security holders and others cannot know all that is being done unless the story is written in an interesting manner, and told as news through the columns of the daily papers.

### Important Extensions

In the great West, and on the Pacific slope, most of the cities depend for their growth upon what is generally known as the "back country." When an electric company, by the extension of its lines into new territory, reclaims thousands of acres of desert lands, it does much not only for the new communities served, but also for the neighboring cities and towns. Great quantities of food stuffs are produced, which must be marketed, and most of the money received is spent close at home. This means that because of the investment made by the electric company all of the nearby towns are benefited. The merchants sell more goods, the real estate men sell more land, the bank deposits swell, the theaters do more business, and incidentally, the circulation of the newspaper increases. The intelligent editor is glad to have such news at first hand and it is up to the company to give it to him in detail—that the people may know. The extension of electric lines depends almost entirely upon the amount of money that company heads are able to secure from Eastern or local investors, and the thoughtful people who read newspapers will realize the immense significance of all news of this character.

### Power Uses

The service of electric energy is unique. Except to a very limited extent it cannot be stored and

consequently must be produced the instant the demand is made by throwing a switch or turning a button. The average consumer has no knowledge of this fact—or how much the company does so as to be in readiness to serve him at any moment. Does the grocer, butcher or baker serve him as quickly? Are the street-car, the telephone or the telegraph companies at his command as readily? Does the gas company or the water company, who may store their products, go to anything like the same trouble and expense to be at the consumer's beck and call? When new enterprises are induced to locate in a community, it is often because of the availability of



Installation of new lighting systems are good news to the people, and accounts of them should be published in the daily papers.

an abundance of electric power. The price at which electric energy may be obtained is often a deciding factor in influencing large industries to build their plants in a city and give employment to hundreds of men. Through the newspapers the public should be informed of what the company has done in building up the territory. It is news to tell of the prospective or actual location of an enterprise through the promotion work and sales efforts of the power company. When new street lighting systems are installed in a city, that is good news to the people, and will be read with interest. When new uses are found for electricity whereby labor is lightened or the world benefited, there is no better or more interesting reading for the average man or woman, and stories of new and important uses for electricity are of frequent occurrence—but the people won't know them unless they read them as news in the papers. The growth of public utility corporations and the absorption or amalgamation of other companies in nearby or distant territories, all indicating the march of progress, are naturally interesting items to newspaper readers. Such expansions and consolidations tend to produce better service, and consumers of the company and subscribers of the papers should have all the facts spread before them.

### Personal Items

Personal items are the smallest things a newspaper prints, but they contain the vital matter—the



human element. The value of a personal item conforms to the sphere of acquaintance of the person mentioned. An officer of a public service company becomes a public servant and as such he must at times consider himself as public property. In many communities, the district manager of a utility company comes in contact with more people in his town than any other man. His assistants are also personally known to many. If these people are promoted, married or afflicted, what happens to them interests many—not because they are more important than anyone else, but because more people know them. The movements of general officers of a company are usually of interest to others—because these men circulate in the territory served in order that they may see and understand local conditions, so that improvements may be instigated and expenditures authorized. It frequently happens that company officials may be creditably connected with other financial, industrial, civic or national organizations and have been public benefactors and maybe have attained special honors or distinction along other lines. All personal items of this character are news, and should be circulated among local papers at the proper time, so that the people may know.

#### Welfare Work

A public utility company should be a leader among the business organizations in a community, and a pioneer in initiating and adopting progressive methods. In this connection there is no more important matter than the relation between the company and its employees. There is much being accomplished along the lines of welfare work for the benefit of employees, of which the public hears little. There are educational advantages, medical services, sick benefit funds, accident indemnities, life insurance plans and pension systems in which the people have more than a passing interest. It is a source of satisfaction for the average man to know that the corporation to which he regularly pays his money has a paternal interest in its employees and offers them present and future protection. The newspapers appreciate the value of such important news stories as may be given out regarding the inauguration or progress of any welfare work which is of interest alike to the company and its employees.

#### State Regulation

In nearly all states there is now a Public Utility Commission, each with power to regulate the operations of utility companies within its jurisdiction. In California this important work is delegated to the Railroad Commission. Perhaps in no other matter is it as essential for the public to be truthfully informed as in connection with the control and regulation of all utility companies by the authorized body. The Commission establishes a uniform method of accounting, so that each company's accounting methods may be along proper lines, and also that the operations of one company may be compared intelligently with any other supplying similar service. The people should know about this. The Commission must approve the issuance of any new corporation securities before they may be legally marketed, and at the same time fixes the minimum price to be re-

ceived by the corporation for such securities. The Commission also must be informed as to how the money obtained from the sale of securities is to be spent. The reasons for all this scrutiny are that there shall be no over capitalization, or what was formerly termed "watered stock," that there shall be no bonds issued without adequate security to the purchasers, and that the moneys derived from selling securities shall only be spent in additions and betterments to the property. The people should be informed of this. The Utility Commission has absolute control over all rates for service and rules governing same. The Commission fixes or approves rates upon the basis of a reasonable return upon actual investment. Operating costs are carefully investigated, interest and depreciation charges analyzed, and rates fixed along scientific lines. The people ought to know this. The Commission lays down certain standards of service which utility companies must follow. Intercourse with consumers in the matter of extensions, complaints, credits and payments are prescribed, all of which affect directly the pockets of the public. The people should know this. The Public Utility Commission is constantly issuing orders affecting utility companies and their customers. These orders are frequently of importance to the individual. The utility company manager should see that all matters pertaining to his company and the utility commission should be handled as vital news. The people should know, first, for their individual information; second, to protect and justify the company, and, third, that the full meaning of an order issued by the Public Utility Commission may be comprehended by the people for whose benefit it is issued.

#### Distribution of News

Just who shall give out the news from a company is a matter of detail. It may be the president, or it may be the press agent, but in any event, it must emanate from some person in authority, who knows what he is talking about. When it is once given to the newspapers, the responsibility of the company ends. Whether it be enlarged or cut down, is a matter which the editor has to judge and pass upon and which usually depends on the volume of other news that he has to consider in the day's work. A public utility company should hand out its news to the daily papers freely and impartially, without any attempt to color, and absolutely without discrimination as between papers. The tipping off of corporation news to favorite reporters or others by various people connected with the corporation will usually lead to serious trouble, and give offense to the paper or papers from which the news may have been withheld. The main thing to bear continually in mind is that the company almost constantly has real news to distribute, that newspapers are glad to publish it as news and that the people want to read the news concerning the utility corporations which are serving them. Consequently, the news should be regularly distributed to and through as many reputable newspapers as are published within the company's sphere of operations—so That the People May Know.



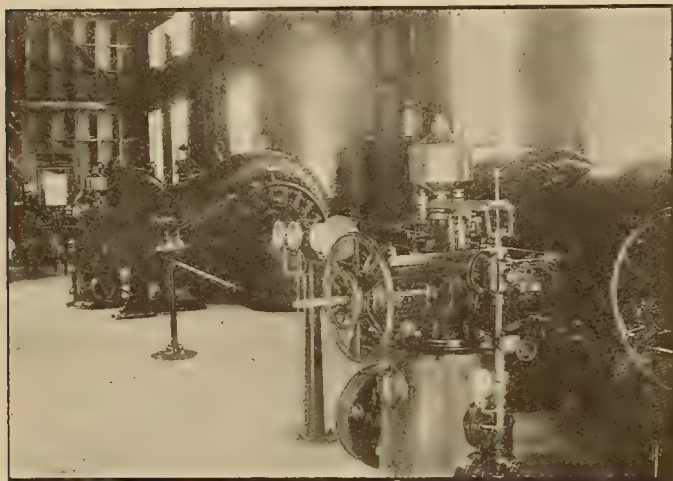
## Progress on the Hetch Hetchy Project

BY M. M. O'SHAUGHNESSY

(The importance of hydroelectric development is being greatly emphasized by the limitations upon oil and coal, and by the increased prices of these fuels. Following is a full account of the progress of the Hetch Hetchy project, which, when completed, will meet much of the increasing demand for power in northern California. The author is City Engineer for San Francisco.—The Editor.)

On August 1, 1919, contract for the construction of the Hetch Hetchy dam, at a cost of \$5,447,792.50 was awarded to the Utah Construction Company. This marks an epoch in the development of San Francisco's tremendous water supply and power system.

The Hetch Hetchy dam will be the biggest structure of its kind in the state of California. It will be



The interior of the power house at Early Intake, by which power is furnished for the various construction operations. The dam at Lake Eleanor was constructed to insure sufficient storage for this plant.

of cyclopean masonry, which consists of concrete, with boulders over one ton in weight deposited throughout the mass.

### Dimensions of Dam —

The dam is to be constructed within 900 calendar days to a height of 226½ feet above the stream bed, and the foundations will extend 75 feet below stream bed to solid granite bedrock. At the crest, the thickness of the dam will be 15 feet, and at the lowest point in the foundation, 320 feet. At stream bed there will be an offset of 80 feet in the foundation, so that the dam can be raised an additional 100 feet in height at any time in the future without additional excavation in the river bottom.

The length of the structure along the crest will be 600 feet, and at stream bed, an average of 100 feet.

Three hundred and seventy-five thousand cubic yards of concrete will be embodied in the dam; 60,000 cubic yards of material will be excavated in the river bed for the foundations.

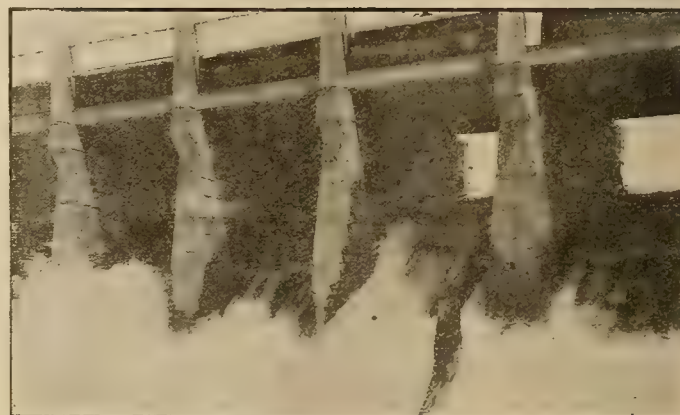
The completed dam will impound a reservoir seven miles long and a mile wide, with a capacity of 346,000 acre feet, or 112,000 million gallons. The present construction will impound 204,000 acre feet, or 66 thousand million gallons.

A bonus of \$200.00 per day is provided for completion before the 900 days, and a similar penalty will be charged for delay in the contract time.

All material for the construction of the dam will be hauled over the city's standard gage railroad, 68 miles in length. This railroad is now operated as a common carrier, and besides hauling the city material, is handling large shipments of lumber for private corporations, thus earning a considerable revenue for the city.

### Power Possibilities —

The completion of the Mountain Division, besides bringing 400,000,000 gallons of water over the most difficult portion of the aqueduct to San Francisco, will render immediately available 66,000 horsepower of electrical energy. This will be generated at Moccasin Creek Power House, where the water will drop from a regulating reservoir at an elevation of 2,140 feet, to a power house which will produce 380,000,000 kw-hr. annually. The elevation of the tail race of the power house will be 925 feet. Between the forebay regulating reservoir for the Moccasin Creek power plant and the Hetch Hetchy dam, will be a tunnel aqueduct 18.3 miles in length and 12 miles of river channel, which, for the present, will be utilized as a conduit for the water released from Hetch Hetchy reservoir. The tunnel work is being advanced as rapidly as funds for the purpose are made available.



The upper picture shows the Eleanor dam nearly completed, looking down stream. It is 1150 feet in length and impounds about 7 billion gallons. Below is the Eleanor dam spillway.



Hetch Hetchy, showing the damsite in the foreground. The dam will be 600 feet in length along the crest and an average of 100 feet at stream bed, and will impound a reservoir seven miles long and a mile wide with a capacity of 112,000 million gallons when completed.



Most San Franciscans have not as yet fully grasped the great extent and value of the Hetch Hetchy water and power supply. The 380,000,000 kw-hr. generated at Early Intake power plant alone, which will be less than one-third of the final potential power development of the project, is 20,000,000 kw-hr., more than is consumed in San Francisco today. The 360,000,000 kw-hr. now consumed in San Francisco is divided as follows:

Street railway system .....	63.6%
Street lighting .....	2.23%
Commercial lighting .....	9.42%
Commercial power .....	21.2%
Miscellaneous .....	3.55%

The uses of power fluctuate during the 24 hours, the maximum being generally at the peaks of street railway traffic, about 8 o'clock in the morning and 5 o'clock in the evening. The average load for the street railways throughout the 24 hours is 40,000 kw., while the peak load ascends as high as 95,000 kw.

With the completion of the Moccasin Creek power house, the electrical energy available for San Francisco will be more than double the present average supply. This will be of incalculable value in aiding the industrial development of the city and bay communities, which have previously been seriously handicapped in their growth by lack of an adequate water and power supply. The European war emphasized this fact so strongly that not only the city, but also private power companies, plan for augmenting the supply as rapidly as construction for the purpose can be rushed to completion.

An output of 250,000 horsepower will ultimately be developed on the Hetch Hetchy project. The city controls a watershed in the Sierras, consisting of 416,640 acres with an annual runoff of  $2\frac{1}{2}$  feet per year, which yields 1,041,600 acre feet annually. This can be dropped in successive stages from elevations of over 8000 feet to an elevation of 925 feet at Moccasin Creek, where the Foothill Division of the aqueduct commences.

The order in which the units will be undertaken is:

Moccasin Creek development,	Capacity 67,000 hp.
Early Intake development,	" 67,000 "
North Mountain development,	" 50,000 "
High Sierra miscellaneous developments,	" 61,500 "

There is already completed and in operation a small power plant at Early Intake, with a capacity of 4500 horsepower, which, added to the output from the plants just enumerated, makes a total available supply amounting to 250,000 horsepower.

#### A Temporary Power House —

The small power house recently completed at Early Intake furnishes power for the various construction operations on the Mountain Division of the Hetch Hetchy project, and, in addition, brings in a revenue of about \$8,000 per month to the city. The building is 80 feet by 30 feet, of asbestos-covered metal, and houses three Francis turbines operated at 720 r.p.m. under a maximum head of 346.5 feet, including a draft head of 15 feet. These turbines are each direct-connected to 2300-v. 3-phase 60-cycle generators with direct-connected exciter. The voltage is stepped up through a single bank of transformers to 22,000 for transmission to the various substations along the 18.3 miles of aqueduct to the west, and to Hetch Hetchy damsite, 11 miles to the east of the power plant.

To insure sufficient storage for this power house, a buttressed arch dam was constructed at Lake Eleanor, in record time. This structure is 1150 feet in length, having a maximum height of 60 feet, and impounds about seven billion gallons. The design of the buttressed arch dam involves several original features. To conform most closely with the topography, the central axes of the arches are on a curve with a radius of 611.35 feet, the arc of which subtends an angle of 30 degrees. Tangent to the central arc and extending to the extremities of the structure, the axes of the arches lie in planes whose horizontal traces form an angle of 30 degrees. There are 22 arches, each with a span of 40 feet, supported by buttresses heavily reinforced. About 10,000 cubic yards of concrete were required in the structure.



Below Moccasin Creek power house another tunnel, 5.75 miles in length, will extend to Red Mountain Bar, where the main Tuolumne River will be crossed with a short steel pipe. Thence a tunnel, 11.4 miles in length, will lead to Oakdale Portal, on the easterly side of the San Joaquin Valley.

#### Course of Pipe Line —

From Oakdale Portal (about four miles southeasterly from the town of Knights Ferry), the commencement of the present survey, to Tesla Portal on the west side of the San Joaquin River (about eight miles southeasterly from Tracy), the aqueduct will consist of 45.2 miles of steel pressure pipes. The thickness of the steel pipe, and hence the cost, is practically proportional to the water pressure, therefore the pipe line was located on the highest ground immediately adjacent to the direct or shortest line to be followed.

Across the thickly populated Oakdale and Modesto irrigation districts, the location has been such as to offer the least damage to the valuable lands and crops, in case of a break in the pipe line.

The San Joaquin River crossing has been selected so as to permit of structures offering the greatest safety during the annual overflow of the river. This intersection fortunately lies practically on the most direct line of the aqueduct, and although not considered in previous studies, is found to be the shortest crossing. The aqueduct will be carried under the river in a submerged pipe line and the lower areas adjacent to the San Joaquin, subject to overflow during the annual floods, will probably be traversed by means of pipe lines on substantial reinforced concrete trestles.

Through the Coast Range from Tesla Portal to Irvington Gate House, except for a small steel siphon crossing the Alameda Creek channel, the aqueduct will consist of tunnels aggregating approximately 31 miles in length. This section has been the subject of close geological study and the surveyed location made follows what is at present considered the most feasible route, avoiding fault lines and rock of uncertain character. The location for the route six or seven miles immediately west of Tesla Portal is as

yet uncertain. For this portion, several alternative lines were surveyed and final selection must be based on more definite knowledge to be obtained by test holes, which will be sunk along the several routes.

From Irvington Gate House westerly, the aqueduct will again consist of steel pressure pipe, 19.1 miles in length, following practically a straight line from the Gate House to Dumbarton Straits, where the bay crossing will be made by means of submarine pipes.

The line thence parallels the Southern Pacific Railroad, through the southerly portion of Redwood City to what is known as the Redwood City Portal, two miles west from Redwood City. Here the aqueduct will consist of tunnels, extending about 11½ miles westward from the Redwood City Portal to the main ridge between San Francisco and Crystal Springs and San Andreas Lakes of the Spring Valley Water Company.

From this point, the tunnels will follow beneath this main ridge to a point about one mile southwest from Baden Station. Here the waters will again enter a short steel siphon, across the low area lying between the main Coast Range and San Bruno Mountain to the San Bruno Portal, crossing the southwest corner of Holy Cross Cemetery and about 500 feet east of the Foothill Boulevard. From the San Bruno Portal to University Mound Reservoir will be in tunnel.

The location of the route has been made in the light of careful engineering studies, the controlling consideration being the permanence of the necessary structures, and the safety of the same, commensurate with reasonable economy.

#### Growing Demands for Power —

Existing enterprises have little to fear from the city's competitive activities, as the demands for power in northern California are increasing annually at the rate of 70,666 horsepower. The output of oil and coal is diminishing so rapidly and prices increasing proportionately that water and power developments, such as the Hetch Hetchy project, attain the highest standard of economic conservation.

Using electric searchlights to illuminate a steel plant at night. This picture was taken at the works of the U. S. Steel Corporation, Gary, Pa., during the strike, when the plant was operated all night, and it was thought necessary to maintain special illumination in case of disorders.







## California Electrical Co-operative Campaign

An Educational Campaign in Which the Various Electrical Interests  
Co-operate to Improve the Industry's Service to the People

### THE ETHICS OF ADVERTISING

BY MERREL E. HIXSON

(The electrical industry is alive with stories of real news interest that make a direct contribution to electrical development. The director of cooperative advertising for the California Electrical Cooperative Campaign here discusses the use and abuse of this type of publicity.—The Editor.)

Camouflaged advertising is old in the annals of newspaperdom and only new by name. The camouflage advertising artist, commonly known as a publicity agent, is the subject of much discussion in the business and news departments of the daily newspapers throughout the country today.

Camouflaged advertising is being warred upon, and the man responsible for its origin (the publicity man) is the center figure in a bombardment in the form of a determined effort on the part of the progressive newspapers to eliminate the publicity man from the advertising fields of today.

It is well to recognize the fact that the newspapers are not all wrong in their efforts. The publicity men, those skilled in their profession, abused their privileges in the news columns of the daily press, overdoing the news feature of their work by camouflaging advertisements wrapped in news matter.

The newspapers have long recognized this abuse, and have hesitated to draw a dead line on the product of the publicity man until of a recent date when the shortage of white paper became apparent and the increased scale of wage went into effect for most all newspaper employees of the mechanical departments. The increased overhead expense and the shortage of white paper had to be met, and the most logical method was to limit the printing of publicity in order to save labor and economize in the use of white paper to conform with the Government's orders to curtail the use of news print paper 10 per cent.

The industries that have taken advantage of the publicity agents' efforts and who have profited most by the use of their product are the Automobile and Motion Picture industries. Those who have abused the generous space allowed by the daily press are the most hurt, as they have been spoiled to a certain extent and are loath to give up the great amount of publicity they have been receiving, as they are well aware of its value and appreciate what it has done in the building up of their industry.

The motion picture corporations and automobile manufacturers, distributors and dealers have long realized the value of display advertising space, and are rated as the country's largest users. The enormous amount of paid space used enabled their publicity men to put over news articles that were interesting to the reading public and were stimulators of trade. Over ambitious men took advantage of a

good thing and have lessened their scope of activities by camouflaging advertising in the guise of news, and as a rectifier of a wrong the newspapers are eliminating to a great extent all publicity that is questionable.

The electrical industry, in spite of the fact that it is the most important of all, has never taken advantage to a noticeable extent of newspaper space in creating a demand for its products, and gaining recognition from the general public as to its standing and relationship with the public.

In the waging of the 10,000 full page electrical advertising campaign for 1920 in California it is to be remembered that this campaign is the largest ever waged in a single State, and the results to be obtained are unlimited and will vary as to the thought and attention given in the preparation of advertising copy, and the proper use of business-building reading matter. Even though the newspapers are warring on publicity they will publish in liberal amounts electrical news and interesting feature stories on the modern uses of electricity. Stories of this nature will be appreciated by the newspapers and are read by the public.

Newspaper men, like the average person of today, are still unaware of the many late uses of electricity and are dependent upon men of the electrical industry to supply the information for publication. In carrying out the educational news feature along with the advertising pages—profit by the mistake of others and when presenting articles for publication make sure that they are newsy news items or real interesting stories, pertaining to the uses of electrical devices in the home, office, factory or on the farm.

Though the curtailment of "termed" publicity is now in effect, it is still possible to camouflage an advertisement in the form of news and get away with it; but in doing so the chances to have published real news of value are lessened.

Every man of the electrical industry should respect the privileges he now enjoys with the press. Moreover he should appreciate the wonderful co-operation on the part of the newspapers in getting out such creditable electrical pages as are now appearing in many cities of California, at the rate of 300 pages per month, to carry out the 10,000 full page Electrical Advertising and Publicity Campaign planned by the California Electrical Cooperative Campaign.

### THE ADVERTISING APPROPRIATION

Members of the Advisory Committee of the California Electrical Co-operative Campaign are continually being asked how much money contractor-dealers should spend in advertising their business.

The consensus of opinion seems to be that three







customers along these lines and would thoroughly believe this doctrine themselves instead of seeing how they could "skin" a job or make it as cheap as possible for the owner, a great forward advance would be made.

### Switch Arrangements

A plan is shown herewith of the first floor of a home wired in the modern way. First of all it has an emergency switch, located in the owner's bedroom, which cannot be turned off by any local switch. Pressing this button immediately turns on a light in every room in the house and certainly adds greatly to the peace of mind of the occupants of the home, because at the slightest noise the switch can immediately be turned on. Burglars do not like such homes. A feature not to be overlooked is the utter absence of drop cords, not one in the house, and every light on a separate switch. Then for all large rooms, halls and stairs, there are 3-way switches, which give as many points of control for each light as is desired. For example, the living room light can be turned on either from the switch located near the front door entrance or from a switch which is handy as one comes into the room from the interior hall. Three-way wiring costs money, but it pays big dividends to the owner in convenience.

### Outlets for Appliances

Notice that in the living room there are also two decorative wall brackets and four outlets located eighteen inches above the floor, which can be used either for heating or for piano, lamp, floor lamps or vacuum cleaner, as desired. Every outlet of this sort in this home is located at this distance above the floor rather than in the baseboard, and not only looks better, but is decidedly more convenient. Furthermore, all of these outlets have a capacity of no less than 25 amperes and from that up.

The dining room, in addition to the main center light, has floor outlet to which is connected a G.-E. Quad receptacle attached to the under side of the table, so that several appliances, such as coffee percolator, chafing dish, toaster, etc., may be used at the same time. There are two heating outlets located in this room besides a duplex receptacle above the serving table.

The kitchen has the light above the sink, another in approximately the center of the room, and a third above the breakfast table. Just below the breakfast table there is another duplex receptacle, so that percolator, toaster, or waffle iron may be conveniently connected, and of course, there is the outlet for the electric range.

In each of the bedrooms there are the usual center lights, also heating outlets and bracket lights as well, conveniently located to dressing tables.

The hall is small, as will be noticed, and into the socket which is conveniently placed approximately at the center is a little Nite-lite transformer and a 2-candle power, 6-volt lamp, which burns all night and sheds just enough light to see by without resulting in a blinding glare.

The bathroom has its outlet for heating, also

outlets for electric water heater, a center light and another above the mirror for convenience in shaving, etc.

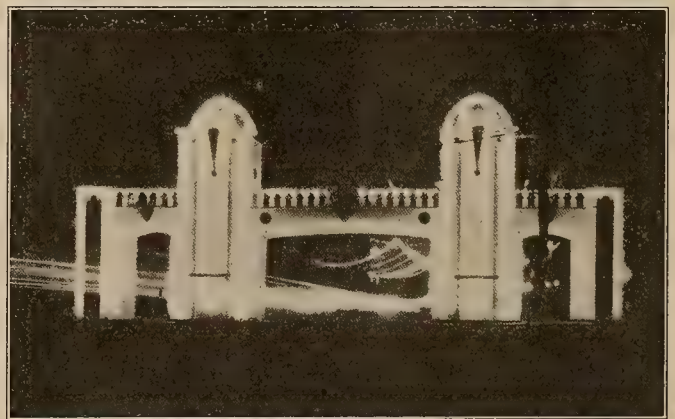
Basement lights are operated either from above or below by means of 3-way switches, which is also true of the lights in the garage. Pilot lights are installed also to insure against leaving the basement and garage lights burning.

### Building the Electrical Home

No mention has been made of the porch lights and others which are ordinarily found in the cheaply wired house, but the whole plan all the way through has been to make the use of electricity as easy and as convenient as possible, and we thoroughly believe good wiring of this sort, and enough of it, would result in greater comfort and pleasure and convenience than twice as much money spent in any other way. Wiring will, of course, vary according to the plan of the home, but in general there should be an abundance of outlets conveniently located, not forgetting outlets for the washing machine, ironer, etc., in the basement and in other parts of the house. Convenient wiring encourages the use of percolators, toasters, grills, electric blankets, hotpads, vibrators, hair driers, curling irons, water heaters, vacuum cleaners, washing machines, dish washers, electric irons, mangles, sewing machines, ranges, and a hundred and one other useful appliances which make life worth living.

Let us do all we can to increase the amount of wiring in the average home by first convincing ourselves of the advantage and convenience of it, and then persistently keeping after the architects and owners until we raise the standard of electric wiring to the level it should occupy.

### GALA ILLUMINATION



Night view of the arch to the Prince of Wales on Georgia Street, Vancouver, B. C.

Various types of electrical illumination have come to play a large part in all public events—fairs such as the Panama-Pacific Exposition, festivals and carnivals, celebrations for distinguished visitors, and so forth. The recent visit of the Prince of Wales was no exception to this rule. Above is shown an electrically illuminated arch erected in his honor on Georgia Street, Vancouver, B. C., and forming a striking illustration of the remarkably fine effects procurable with this form of decoration.



# Buying Electrical Supplies and Appliances for Profit

BY J. E. BULLARD

(Does the Contractor-Dealer's prosperity depend ultimately and chiefly upon quick sales and satisfied customers rather than upon large discounts? If so, all buying should be done with this idea uppermost, and the contention of this writer is that higher priced goods with national advertising have a more rapid turnover than cheaper goods locally advertised, bringing more real profit to the dealer in the long run.—The Editor.)

Some one has said, "Buy merchandise and not discounts." In other words, buy goods that you can sell again rather than goods that can be purchased cheap. It makes little difference how great a profit can be made on the goods purchased if they cannot be sold. If they remain in stock long enough they are bound to eat up all the profit margin and perhaps some of the capital invested in them as well.

## Big Sales vs. Big Discounts

It is big sales and not big discounts that determine the annual profits. It is the number of times that the money invested in the goods can be used in a year that determines the prosperity of the dealer and not the amount of profit made on individual sales. It is very hard for many a dealer to realize this. It is because so few retail business men do realize this that less than five per cent of the men in the retail business today are making money, and more money than they would be making if they sold out their business and went to work at a salary for some other concern.

There is a rather general impression that the most successful buyer is the man who can buy goods at the lowest cost. Buying goods cheap, however, does not necessarily mean that success will follow. Goods purchased at a higher price which can be sold at once will result in more real profit than goods bought at a much lower price which will have to be held in stock until they become shop worn and must be sold at a discount if they can be sold at all. It is perfectly proper and right to buy goods cheaply if they can be sold quickly. It is expensive, however, to buy goods at low prices which are going to keep the capital invested in them tied up for too long a time.

## National Advertising and Quick Turn Over

It is these features in regard to buying which are causing more and more business men to turn towards nationally advertised products. The profits on the individual sales may not be as great on these goods but it is usually possible to sell them more quickly, to turn them over more often, to make the money invested in them earn more profit in the year. The reason for this is that the extensive advertising has already partly sold these goods. All that the dealer finds it necessary to do in order to sell them is to display them attractively.

There is also another advantage attached to the selling of well advertised goods. The constant sales pressure brought to bear by the advertising tends to make the demand more constant, so that for goods which are not seasonable the probable demand can be quite accurately estimated and the quantity carried in stock can be held down to the minimum. This naturally means more turnovers each year with the greater profits that go with increased turnovers.

## The Advertised Standard

Still another advantage connected with goods that have been widely advertised for a considerable period is the fact that these goods are bound to give satisfaction. Perhaps the greatest good that advertising has done has been to improve the quality of the goods advertised. It has long been recognized that it does not pay to advertise goods that will not render perfect satisfaction in service. This has tended to make the manufacturers who advertise their goods improve them to a greater extent than would have been the case if they were sold through personal salesmanship alone. In any case it has caused them to keep the quality of their product uniform and reliable.

## Building Good Will

This brings up another important point in buying. Not only must those goods be purchased which can be sold in the shortest possible time, but the greatest care must be exercised in selecting goods that will render such good service to the purchasers that they will return to the dealer from whom they made their first purchases in order to buy other articles. It makes no difference how quickly goods can be sold. If they do not give satisfaction the dealer will have to pay the price in good will and this will eventually make serious inroads into his profits, and may drive him out of business altogether.

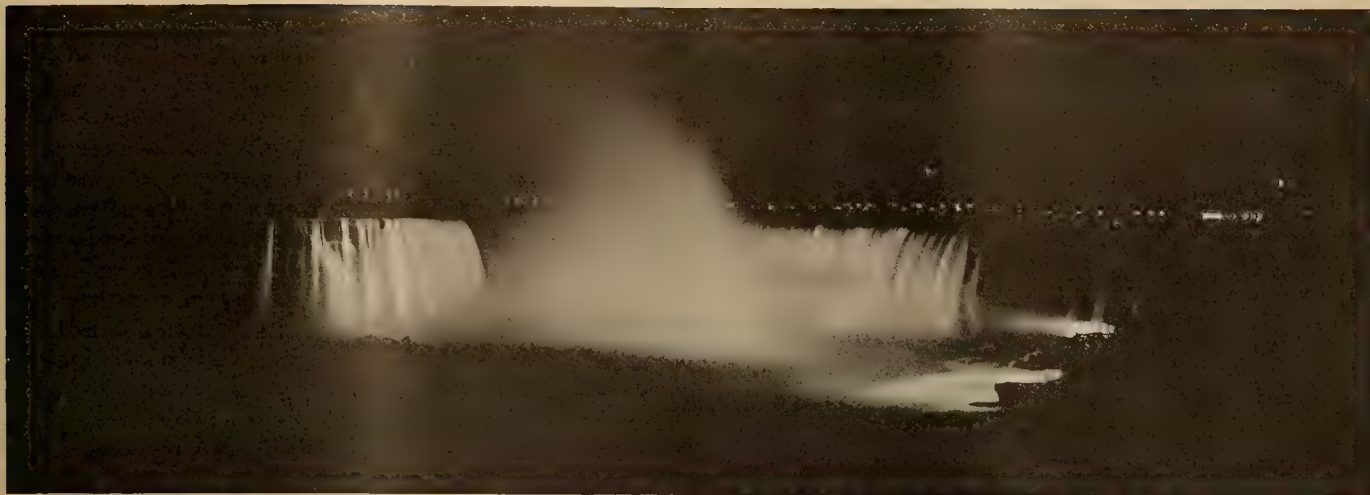
This merely indicates how valuable good will really is, how much it means to permanent success, and how important it is that every time a dealer in electrical supplies, utensils and appliances buys any goods, he test these goods by the amount of good will their sale is going to build for him. To make the greatest ultimate success in the retail business it is necessary to more than merely satisfy, it is necessary to please one's customers.

## The Secret of Successful Buying

An easy way to tie up a lot of capital that cannot be used is to carry too many brands of the same articles. It is easily possible to carry so many that the volume of sales is actually reduced as a result. The smaller the number of brands carried for a given variety of stock, the greater the rate of turnover that can be made and the greater the profits that will result.

The secret of successful buying can be defined as buying those goods which will result in the greatest possible number of turnovers per year, which will give the customer the greatest satisfaction; to buy no more brands than are required to meet all the demands of the customers; and last of all, to buy all these goods at the lowest price. It will be noted that the price paid is given the least importance. It is perfectly proper to purchase the goods at as low a price as possible, but they should meet all the other demands of good merchandising first.





The Horse Shoe Falls at Niagara illuminated at night. The Prince of Wales on the occasion of his recent visit was the first to press the button putting this great installation in operation

## Flood Lighting Niagara Falls

(The subject of outside illumination is one which has received especial attention of late, and an example of the way in which it is being applied to show places is provided by the following account of the new flood lighting installation at Niagara.—The Editor.)

The ingenuity of man has enabled the Horse Shoe Falls at Niagara to illuminate themselves; the force of their own waters hurtling over the falls supplies power to ninety-one flood lighting projectors. These in turn throw a powerful light on to the entire falls.

The methods used to produce this pleasing result are interesting even to the layman; they have a special significance for those who are interested in lighting.

### Lighting from Two Directions

The lighting is by means of a main and a secondary battery. The first located on the corner of the roof of the Ontario Power Company's plant, and



Projectors mounted on Ontario power house for flood lighting Niagara Falls

the second on the roof of Table Rock House. From the location of the main battery light can be directed to all parts of the falls, with the unique advantage also that the apparatus makes no bid for the attention of sightseers during the daytime. It does not intrude upon their gaze; only those having a special

purpose will spy out its location. Another advantage of that location is that it is separated only by the roof from an ample source of power. But there is one disadvantage necessitating the installing of the secondary battery on Table Rock House and which results from the occasioned rising clouds of spray. When the spray is up it is impossible to see from the roof of the power house the crest of the falls near the apex of the horseshoe. This necessitated the installing of the secondary battery of ten short focus projectors on Table Rock House.

The distances are greater than occur with the usual flood lighting problem. The height of the falls is 158 feet, and at the longer distances the diameter of the beams is greater than is necessary to cover the face of the falls. Where this occurs the tops of the beams are directed to the crest, while the diffused light from the main projectors is depended upon to illuminate the waters at the base of the falls.

No attempt has been made to penetrate the rising spray with artificial light, because even though this were done the view of the falls would still be obstructed by the spray itself. Better results have been attained by lighting up the falls by means of the secondary battery on Table Rock House, whence there is a splendid view. It was found, too, in the final adjustment of the beams, that more of the contour of the falls towards Goat Island could be illuminated and each zone was spread out slightly to accomplish this end.

### Details of Installation

The installation was designed and erected by the Hydro Commission's engineers, and Mr. George Beattie, of the Electric Shop, Toronto, cooperated with the commission and supplied the reflectors. Long-focus projectors, utilizing the regular type of gas-filled lamps, comprise the main battery. These were selected because such lamps are more readily obtainable, and, too, because it was not thought nec-



essary to utilize high beam concentration. The areas to be lighted are large, and they are both vertical



The main battery of projectors, divided into 9 banks of 9 units each. Each projector contains one 1,000-watt lamp.

and horizontal. And as all the light below the rim of the falls illuminates interesting surfaces there is little or none of it that can be deemed wasted.

The main battery is divided into 9 banks of 9 units each, and each of the 81 projectors contains one 1,000-watt lamp. Each bank is equipped with a service box containing fuses and switch and is a complete three-phase unit in itself. And all service boxes are protected from spray by tight fitting wooden housings. Flexible conduits connect the sub-feeders to the projector sockets. The conduits are securely fastened at each end so that any accumulation of ice will not impose a strain on the wires. Three 30-kw. transformers, located close to the projectors, are connected to the 2,200-volt busses in the power house by lead covered cable in conduit. Weather proof cable is used for low tension feeders.

## Arc Welding

BY F. A. ANDERSON

(The properties of various metals in their relation to welding, the efficiency of welds, together with the various factors which contribute to successful work, are here discussed by the electrical inspector for the U. S. Shipping Board in San Francisco, in the second of a pair of articles on arc welding.—The Editor.)

It is not the intention of this paper to go into the full metallurgy of arc welding, but a few suggestions are offered as to the properties which certain ingredients impart to the metal.

### Properties in Iron and Steel —

**Carbon** in the combined state adds strength, hardness and brittleness to the metal. The first effect is desired in all metals, the second in many, while the last must always be guarded against.

**Manganese** in the proper proportion counteracts the ill-effects of sulphur and phosphorus, prevents to a degree the formation of large crystals, produces a hot ductility and permits the metal being worked at higher temperature.

**Phosphorus** is considered by some as an impurity, although it produces a tensile strength nearly equal to carbon, but counteracts its own value by adding a brittleness to the metal when cool.

**Sulphur** is an impurity. It has a tendency to cause the metal to crack while hot, which is a strong argument for using as low a heat value in the arc as is possible to obtain the successful union of the metals.

**Silicon** is another element considered by some as an impurity and though no definite fault can, with certainty, be traced to its presence, practice has limited the allowable content in steel for it has been well established that it adds no value to the metal.

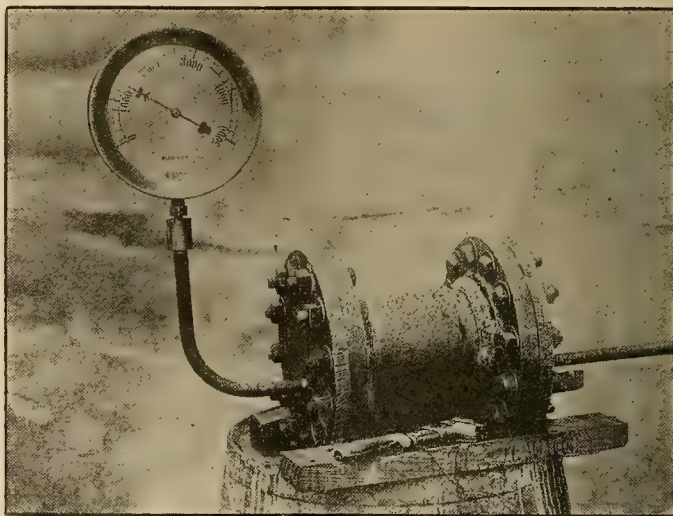
### Heat Adjustment —

From the foregoing it will be apparent that the composition of the usual ship's plate and the usual commercial mild steel electrode are very similar in chemical composition and that with the proper heat correctly applied, the union of the metals may be accomplished.

It is the adjustment of the electric arc to produce this heat that proves the stumbling block to many operators.

The melting point of steel is variously given at from 2372 to 2678 deg. Fahr. Cast iron from 1922 to 2786 deg. Fahr., and wrought iron from 2732 to 2912 deg. Fahr.

The metallic electric arc is estimated at from 3600 to 4000 deg. Fahr., the volume of this heat being governed by the wattage of the arc. One kilowatt hour of electrical energy is equal to 3,413 B.t.u., therefore 150 amperes at 20 volts (a very common adjustment in arc welding) will produce



Specimen made up to test efficiency of arc welding on an extra heavy 6-in. pipe. The weld was tested hydrostatically and held beyond 1400 lbs. Note water spurting out at top where gasket has given way.

3 kilowatts or 10,239 B.t.u. in one hour. This is about the same amount of heat as is produced by 6.6 cu. ft. of acetylene gas burned in 7.5 cu. ft. of oxygen.

### Adjustment of Arc for Heat —

On two recent occasions I have seen this adjustment of heat thoroughly demonstrated. In the first instance a man was using a new type of machine.



He was an experienced welder but was not wholly familiar with the adjustments required on this machine. His adjustment in both volts and amperes was too high, with the result that metal was being burned, gas pockets were formed, slag was included



Same specimen with new flanges, reinforced. The flanges dished  $\frac{1}{2}$  in., the specimen finally rupturing at 208,000 lbs.



Same specimen under a tensile strength test, which dished  $\frac{7}{8}$ -in. steel flanges and pulled a  $1\frac{1}{2}$ -in. bolt through the plate. Failure occurred at 119,000 lbs.

in the weld, oxidization was excessive and the metal brittle. I had him readjust the machine until the amperes and volts were of the proper value to give a heat sufficient to melt both the parent metal and the electrode at a practically uniform temperature, producing a weld almost entirely free from these faults—the two welds were on the same piece of metal—one on either side. Two cuts were made through the plate and the welds examined; the first described operation showed clearly the faults mentioned, while the second showed practically a perfect weld and union of the metals.

The second instance was similar in most every detail—it was however, a different operator and a different type of machine. In making examination of these second samples or plates I carried the test further and hammered the weld material to gain an idea of its ductility. The weld which had been made with the proper heat beat into and elongated with the parent metal, while the other weld cracked and dropped out in small particles.

In each instance the two operations were performed by the same man with the same machine, using the same electrode and the same parent metal,

one operation being satisfactory and the other unsatisfactory, the only difference being the proper adjustment to produce the correct heat for the particular combination of metals.

While the chemical composition of the metals is a governing factor in determining the proper heat required; this heat may be, and is, usually found by the operator's experiment and adjustment. In other words, he tries his electrode on the parent metal and is able to tell from the result when a proper adjustment is obtained.

#### Efficiency of Welds —

The efficiency of a welded piece depends to a great extent upon the ability of the operator, and where the cross section of the weld is equal only to that of the parent metal. It is rare that a 100 per cent weld is obtained, although many instances of such have been recorded.

A recognized authority on the subject of Blacksmith welding,\* conducted tests to determine the true value which could be relied upon, and, although he selected for his test smiths who were experts in their line and men who were daily rendering satisfactory service, the average of the welds on metal of known chemical properties produced only from 44 to 71 per cent in tensile strength of the original piece. This author, commenting on another series of tests,



A bronze rotary pump stage. This was first welded by acetylene, but cracked when cool. It was then electrically welded on either side, after which no further trouble was experienced.

says: "In most cases where the test bar broke in the weld the pieces parted at the surfaces of contact, showing that no true union had taken place; one or two fractures were homogeneous, but they showed the coarse crystallization that follows overheating."

In a report where about 110 arc welds were tested and where various machines and different makes of electrodes were used, the result in tensile strength showed, one weld of 40 per cent, one 60 and one 70, the others were 80 per cent and above, several showing 100 per cent, while the general average was about 88 per cent. It has been the generally accepted estimate among users of the arc welding process that at least 80 per cent can be relied upon in flush welds and 100 per cent and over where the area of the weld may be sufficiently increased. Practice has demonstrated that these

\*H. H. Campbell, "Manufacture and Properties of Iron and Steel."



estimates are conservative and allow for the human error, when competent and experienced operators are employed.

Pieces from the same samples were carried through bending tests and ruptured at various angles from 10 to 43 degrees. In each case the maximum strain was brought directly on the weld and while the result is not all that may be desired, it is about



Electrically welded automobile housing—an example of the effective welding of malleable iron.

the average of autogenous welding. A number of much more satisfactory results have been obtained by the arc welding process, and I have a report of one instance where a specially prepared and coated electrode was used in which instance the welded material withstood the strain of reverse bending beyond the rupture of the parent metal.

A number of tests were conducted on specimens welded by the acetylene process and these ranged in tensile strength about the same limits as the arc welding specimens, although the general average was considerably lower.

#### Welding of Special Steel and Cast Iron —

The welding of high carbon or special alloy steel and other metals may be accomplished by the use of the electric arc. No general instruction can be given, for the special condition of each case must be studied, a proper formula evolved, the operation thoroughly planned and carefully carried out.

Some creditable results have been obtained with the electric welding of cast iron, but it has not, to the writer's knowledge, become a recognized or acknowledged success. The matter is being carefully studied, experiments are being carried on and satisfactory results may yet be obtained. Some fairly satisfactory repairs of cast iron have been made by the arc welding process using mild steel or pure iron electrodes. In many instances they were attended by two prominent faults: one a stratum of so-called "chilled" iron immediately adjoining the weld, the other a weakened area a short distance outside the

weld where the intense heat of the arc has seemed to produce a "critical point." It is here a subsequent break is apt to occur.

#### Coated and Covered Electrodes —

A number of coatings for electrodes have been developed; they have brought forth much discussion, some attributing to them much credit for the success of the operation, while others pronounce them of no actual value. One well known covering is in the form of an asbestos string saturated with chemicals, which forms a slag coating over the weld; another is a compound which adheres to the electrode and likewise forms a slag coating (it is claimed that this also retards oxidation during welding), while still another has a so-called flux coating for which it is claimed that it promotes the union of the molten metal. Silicate of soda, bismuth, and ordinary milk of lime (whitewash) have been used separately and in combination. Whatever value these coatings may possess, their element of danger must be guarded against, and care must be exercised that none of the impurities which the preparations may contain are included in the weld.

#### Non Ferrous Metals —

Copper, phospho bronze, brass and ferrous metals may be arc welded, but experience and a careful study of the particular work are necessary to produce successful results. The use of a graphite electrode and metal as a filling rod is often found a more satisfactory method than using the metal itself as the electrode.

#### Carbon Welding —

In carbon (or graphite) welding, the carbon should be negative. Carbon welding will be found useful in heavy welding, sometimes in cast iron welding and the welding of copper to steel, like welding rail bonds to the rails. Cutting may also be done with the carbon arc, but its use is only advocated where the acetylene torch cannot conveniently be employed.

#### Clean Work —

In all welding the value of clean metal cannot be over-estimated, and it is strongly recommended in arc welding that the metal be first cleansed and then kept clean, removing as often as necessary the accumulation of oxide produced by the action of the arc.

It is only in very recent years that arc welding has attracted the attention of technical men and engineers, the art having found its progress through a proven value as well as the ingenuity and ability of the practical men of the trade, which is another instance proving Prof. Campbell's statement that:

"The opinions of practical men are sometimes of more value than the learned conclusions of theorists, and must never be ignored, but they are not always inerrant."

The harmonious cooperation of the practical and technical men, working to correct each other's errors, can make rapid strides in the improvement of arc welding, and produce an art which is constantly increasing in value to mechanical science.



# Hatching Eggs Electrically

BY PAUL J. DENNINGER

(Electricity is coming to play an increasingly important part in the development of rural districts. Among the interesting recent applications is a singularly successful electric hatchery described here. The author is district agent at Whittier for the Southern California Edison Company.—The Editor.)

Application of electricity as a means of heating incubators and brooders has recently been perfected and proves so ideal in economy and simplicity of operation that all other methods of incubation will sooner or later be abandoned wherever electric current is available.

600 watts. One element is used to an incubator and the brooders contain one or more elements, depending upon the size and capacity of the brooder house.

The controlling device is unique in construction yet simple in operation and easily adjusted. It is a thermostat and known as the tandem wafer type.

The wafer is composed of two brass disks soldered together and the air space between is filled with ether. To the center of the top wafer is attached a perpendicular control rod. This rod extends up through the framework and operates a horizontal control lever. The lever is weighted at the opposite end from the control rod to give a positive and steady action. This lever is attached by means of a coil spring to a rocker-arm pivoted at the center of its length. It is this rocker-arm that makes the contact and opens or closes the circuit as the wafers expand or contract. The connection between the

lever and the contact arm is made in such a manner that the arm will not move until there is considerable tension on the spring and when it does move the action is positive and the opening or closing of the circuit instantaneous. In this way burning or fusing of the contact points is practically eliminated. The entire mechanism is operated by the contraction or



Interior view of Electric Hatchery. The distribution is 220-volt, three-wire, with the load divided into 110-volt units. The incubators are operated on the stored-heat principle and occasional interruptions to the service do not affect them. Their cleanliness and the absence of soot, oil and gas combine to insure uniformity of output and an unusually sturdy chick.

## Thirty Thousand Chicks a Week —

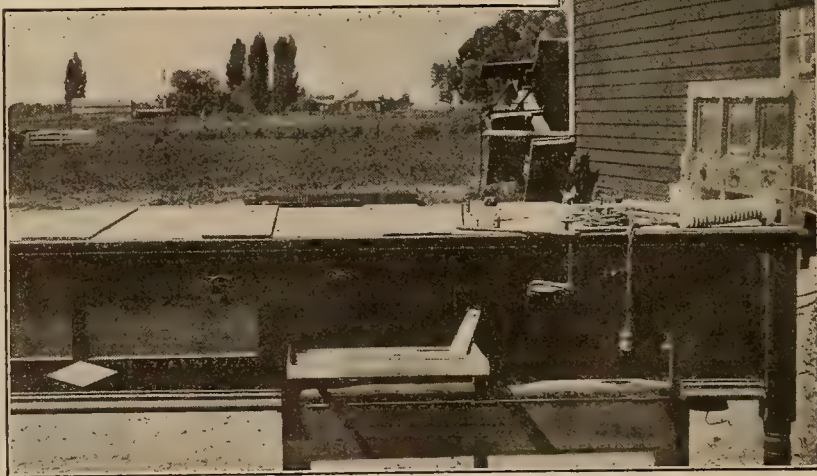
Many other methods of heating have been used in the past to hatch eggs, among them being the kerosene lamp, gas heater, solar heater and steam, but the only successful automatic incubator is that operated by electricity, with the possible exception of nature's method, the old hen, and even she will sometimes desert the nest.

In the vicinity of Artesia, in the Whittier district, is located the largest electric hatchery in the world. This plant now has a capacity of approximately 100,000 eggs and a weekly output capacity of about 30,000 chicks. During seven months of the year this plant is working at full capacity most of the time and the annual output will average close to 750,000 chicks. It is here that the first successful electro-incubation has been achieved.

## Safety Provisions —

Construction of the incubator itself need not be here discussed as the electric heat and control may be applied to any type of incubator. The electric heating unit consists of a cylindrical, grooved porcelain core. In the groove is wound a resistance coil made of nichrome wire licensed under the Marsh patents. The resistance coil being laid in a groove, makes the heater self-insulating and there is no danger of the coils coming in contact with the metal flue or any other cover with which it may be surrounded. The current consuming capacity of each element is

Close-up view of electric incubator, sometimes called the "electric hen." Each unit has a current consuming capacity of 600 watts, controlled by an automatic device which regulates the heat to a variation of one degree. The danger of fire, a common characteristic of old-style incubators, is entirely eliminated. The cost of operation, from every viewpoint, is surprisingly low.



expansion of the tandem wafer, the ether confined in the disks being so volatile that a slight variation in temperature will cause immediate contraction or expansion sufficient to move the control up or down, thus opening or closing the circuit.



### Power Arrangements —

Very attractive rate schedules have been established for this business although small installations can be operated profitably on the lighting schedule. Where consumers have the combination schedule for lighting and cooking incubators can be added to the circuits without increasing the minimum, thus obtaining advantage of the cooking rate of three and one-half cents per hour. The consumer who is operating a pumping plant may apply his pumping plant rate to the incubator and brooder load by increasing the minimum charge one dollar per month or horsepower equivalent added in incubator or brooders. There has also been provided a schedule for the monthly minimum of \$10.00 per month and the rate of three cents per kilowatt hour which may be applied exclusively to electric incubation. The cost of operation depends a great deal on local conditions, but it is generally estimated at one cent per chick.

The advantages of electric incubation are many and such as to make this method far superior to any other. There is no danger of fire, no loss of chicks from chilling or overheating; no lamps to clean, fill and adjust, no gas burner to go out and asphyxiate the chicks with escaping gas. Just push the button or turn the switch and devote your time to other pursuits as the automatic control needs very little attention. All these advantages spell increased profits, not only from economy of operation, but by virtue of the uniform heat control more and better chicks are assured. With the perfection of electric hatching and brooding the old hen is left free to devote her entire time to egg production, and even here electricity is rendering aid by illuminating the coops and chicken yards, thus getting the hens on the job earlier in the day. So, it may be in time the rule will be two eggs per day instead of one.

## Technical Hints

BY LOUIS ETSHOKIN

(Among the problems which frequently fall to the lot of the contractor in arranging for small installations is that of determining upon the type of motor best suited for a given purpose, such as driving a pump for irrigation. The various practical aspects of this question are here taken up, and the possibilities discussed. The author is electrical engineer with the Halcun Radio Company, San Francisco.—The Editor.)

### GETTING THE MOTOR TO RUN A PUMP

Frequently, a contractor has to determine the necessary horsepower of a motor to drive a pump delivering a certain amount of water through a given head. This problem might arise in a small irrigation plant, a mine, an institution or school pumping its own water, or even in a small town.

Assume that we want a pump that will raise water fifteen feet and then send it out at a pressure of thirty pounds; 5,000 gallons is to be delivered per hour. The problem is to figure the size of the motor, and the type of motor best fitted for this service.

Assuming a gallon of water to weigh eight pounds, we must deliver 400,000 pounds per hour, or

6,333 pounds per minute. As a pound per sq. in. pressure is equal to 2 ft. of water, we can consider roughly that we have to lift our 6,333 ft. of water through seventy-five ft. in one minute. This calls for 475,000 ft. lbs. per minute. As one horsepower is 33,000 ft. lbs. per minute, the pump will have to deliver approximately 14 horsepower. To be on the safe side we should not figure the efficiency of the pump as over 60%. Consequently the motor must have 14/.60 or about 23,—say 25, horsepower.

Now the question is, what type of motor shall we use to drive this pump? Let us first consider the type of pump we will use. We could not very well use the ordinary type of centrifugal pump, on account of too much head. We could use a multi or even single stage turbine pump; a rotary pump such as the above has the advantage of being adapted to motor drive, as there are no reciprocating parts, and it can run at a speed something like normal motor speed.

With this type of pump also, the very simple squirrel cage induction a.c. motor, or a shunt d.c. motor does very well, because very little torque is necessary on starting.

On the other hand, a reciprocating pump is more positive, and is therefore more reliable for use, say in time of fire; also most mechanics are more familiar with it, and can repair it more readily. Such a pump, though, starts at full load, and therefore requires a motor with a high starting torque. It is possible to use a compound d.c. motor or a phase wound induction motor, or any type of repulsion-induction motor.

A desirable speed for the motor would be about 600 r.p.m. to run a 60-r.p.m. pump, having a reduction ratio of 10 to 1; this would make a motor of reasonable size and cost. For an ordinary water system using a reservoir, speed control would not be necessary as the level in the reservoir could be kept at a certain height, and the motor stopped or started according to this level.



A small motor used to run a pump for irrigation on a farm. The increased use of electricity in rural districts makes of especial importance to contractors the practical questions which come up in connection with its various applications on farms.



## The New Physics

BY DR. A. C. CREHORE

(The relationship of mass to weight has long perplexed the student of engineering because it is especially true of the beginner that the eternal mistake is made of calling the two the same thing. The author herein discusses this relationship from an interesting viewpoint that sheds new light on the constitution of matter.—The Editor.)

The second reason for believing that mass has the dimensions of the reciprocal of specific inductive capacity is to be found in the author's theory of gravitation. A brief account of this theory is required in order to render the matter intelligible.

An equation<sup>1</sup> has been found which represents with fidelity all of the laws of gravitation as originally given by Newton. This equation carries the matter one step farther than Newton went, for he stopped with the ultimate particles of matter, and did not attempt to explain the cause of the gravitational force, contenting himself with the mere statement of the simple laws governing these forces. The equation referred to goes further and attributes the cause of the gravitational force to the electromagnetic action of the negative electrons contained within the atoms of matter. The equation attributes the existence of the force to the motion of the negative electrons, and shows that the positive nuclei of the atoms have nothing to do with the force except indirectly, because they are electrically bound to the electrons. If the motion of the electrons could by any means be stopped, it shows that the gravitational force would be reduced to zero, and while the motion persists, that the force is proportional to the kinetic energy that these electrons possess. This conception does not offer any prospect of ever being able to stop the motion of these electrons and thus to annul the gravitational force. If we were successful in stopping the electrons even to a small extent, at the same time we would destroy those forces that serve to bind the atoms together, and just so much matter would be disintegrated into individual electrons, and cease to exist as ordinary matter.

To some this conception of the gravitational force may at first present difficulty because it has already been seen that the mass of atoms is concentrated in the positive nuclei. This difficulty arises from an erroneous idea that must ever be combatted that mass and weight are the same thing. At a given locality on the earth's surface different masses are strictly proportional to their weights, but mass and weight are not by any means equal the one to the other. This is clear as soon as the body is carried to some different locality further from the center of the earth. Here the weight of the same piece of matter has changed, but no one believes that its mass is any different than it was before. It is necessary to distinguish carefully between mass and weight. They are entirely different concepts, but the reason that they are numerically proportional to each other is easy to see. It is because the electrical charge on the positive nucleus of each atom in its common neutral state is exactly the same as the sum of the electrical charges on all of the negative electrons that it contains.

The equation that gives the average attraction of one electron for another, neglecting all of the electrostatic forces which are cancelled by the action of the positive nuclei of the atoms, is

$$F = \frac{1}{3} m_0 e^2 \beta_1^2 \beta_2^2 r^{-2},$$

where  $m_0$  is the mass of the negative electron at slow velocities, and  $e$  its electrical charge.  $\beta_1$  represents the ratio of the velocity of one of them to the velocity of light and  $\beta_2$  that of the other.  $r$  is the distance between the centers of the orbits being described by each around its respective atomic nucleus.

It should be emphasized that the equation represents the average force for any pair of electrons. As the electrons revolve about their orbits the force that they exert upon each other evidently varies from point to point, and it is the average value for a large number of revolutions with which we are concerned resolved along the line joining the centers of the orbits. And, again, the planes of the two orbits may be inclined to each other by any angle whatever, which would produce a different force for each different inclination. An average is also required for the orientation of the orbits, because in any piece of matter save crystals it is probable that there are pairs of orbits situated in every possible orientation. The above equation also includes such a space average as this, as well as the time average.

Let us now examine the dimensions of the two members of this equation. The dimensions of the left member are those of force, which on the common system of mechanical units are

$$F = L M T^{-2} \quad (\text{See Table I.})$$

The dimensions of the right member are those of  $m_0 e^2 r^{-2}$ , since the betas are pure numerics without dimensions. On the electrostatic system as above derived the dimensions of  $e^2$  are

$$e^2 = L^3 M T^{-2} k.$$

Multiplying this by  $M L^{-2}$ , as the dimensions of  $m_0 r^{-2}$ , gives the dimensions of the right member of the equation as

$$L M^2 T^{-2} k = L M T^{-2} M k.$$

The two members thus have the same dimensions only by making the dimensions of  $M k$  equal to zero. By giving to mass the reciprocal of the dimensions of specific inductive capacity the equation for the force becomes a true physical equation between quantities having the same dimensions. This gives mass the dimensions of velocity, and makes force have the dimensions  $L^2 T^{-3}$ . This is natural for the dimensions of force because energy is equal to force multiplied by distance, and multiplying these dimensions by  $L$  we have  $L^3 T^{-3}$ , the cube of a velocity, which are the dimensions of energy in the table.

<sup>1</sup>A. C. Crehore, *Physical Review*, Vol. XII, No. 1, Sec. Series, July, 1918, equation (10), page 17.



# Office Records Their Filing and Indexing

BY IRENE WARREN

(A great difference is made in the efficiency of filing by the type of equipment used, and the manner in which it is arranged. The director of the Chicago School of Filing and Indexing here discusses the various types of cabinets and supplies available for the filing department. This is the second article of the series.—The Editor.)

## CABINETS AND SUPPLIES

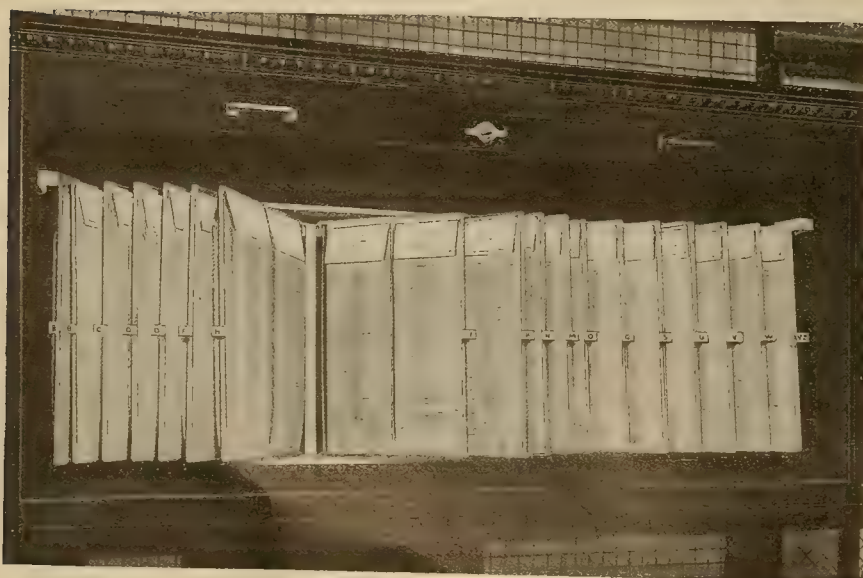
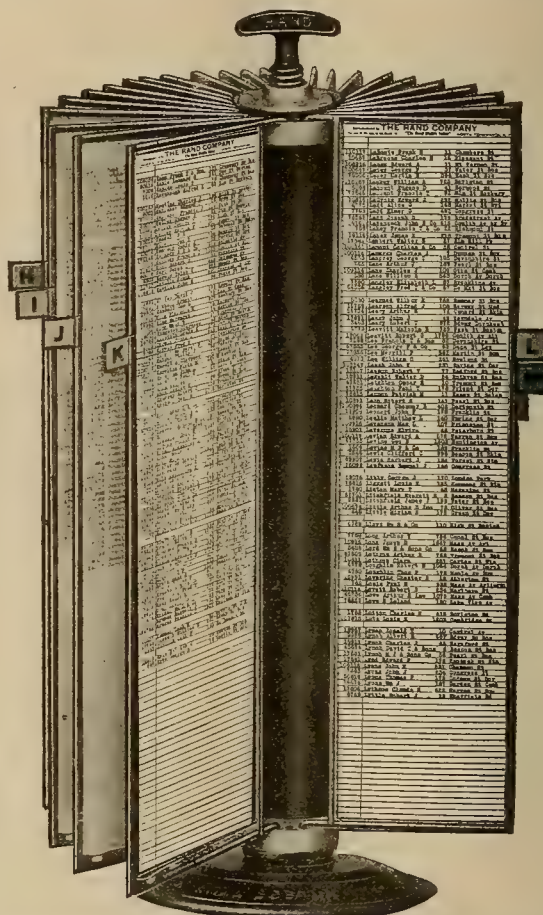
The filing department should be so placed in the concern that those departments that use it most frequently find it easily accessible.

There are two methods of filing materials, on shelves or in cabinets. It is better to file everything, except books, in cabinets, which are made in standard sizes varying considerably in measurements to fit standard sizes of business forms. A third style of filing has been worked out for records on various size cards which is known as visible filing. It is most satisfactory for short records that have to be consulted quickly, and seems to be constantly gaining in favor for longer records.

### Supply Houses

A number of firms, such as the Globe-Wernicke Company, the Art Metal Construction Company, the

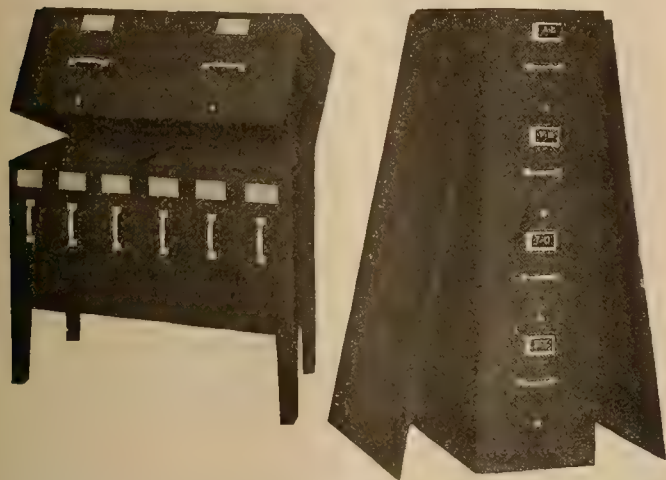
Shaw-Walker Company, the Library Bureau, Yawman & Erbe, the Rand Company, Acme Card System Company, and the Macey Company make the equipment and the supplies necessary for filing and indexing. While each handles some specialties, they all have the standard sizes of cabinets, and stand supplies for the most used systems of filing, such



Various types of visible files suitable for filing short records that have to be consulted quickly and at frequent intervals. This type of file is becoming very popular even for use with longer records.



as the alphabetic, the alphabetic-numbered, the geographic, and the numeric systems. Most of these companies have branches in the largest cities, and many have agencies in the smaller cities. A careful study of their trade catalogs, which will be sent on request, will give you a good idea of standard lines and the specialties that each company handles. The



Files may be built up horizontally or vertically. The top in one case, and the sides in the other, are purchased at first and moved up or to the side as the occasion demands.

Gaylord Brothers and the U-File-M Binding Company, both of Syracuse, New York, the Democrat Publishing Company of Madison, Wisconsin, the Dennison Company, and some of the best stationery stores handle mending tissues, pamphlet boxes and cases, signals and other devices which will aid the file clerk.

### Types of Cabinets

Filing cabinets are made in both wood and steel and in three standard finishes; mahogany, oak, and a very pleasing olive green enamel for the steel. Some people prefer wood and some steel. Those favoring wood, like the feeling of the material and think steel very cold and disagreeable to handle; those who prefer steel claim it is cleaner, mars less easily, takes up less room for equal filing space, and has greater strength and durability. A very well constructed steel cabinet will probably protect papers better in case of fire, than will a wood cabinet.

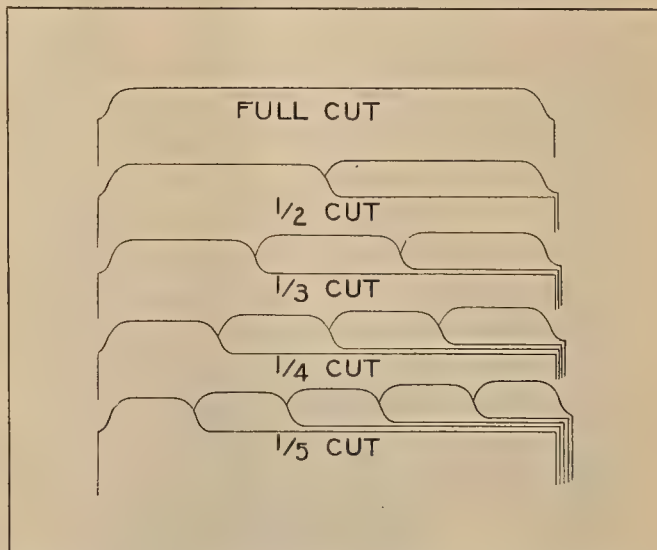
The standard makes of correspondence size cabinets are the same in height and width but they



Transfer storage cases in steel, wood, or wood and tarboard combined, may be arranged in low batteries or those extending to the ceiling as necessity demands. An extension ladder is used with the very high ones.

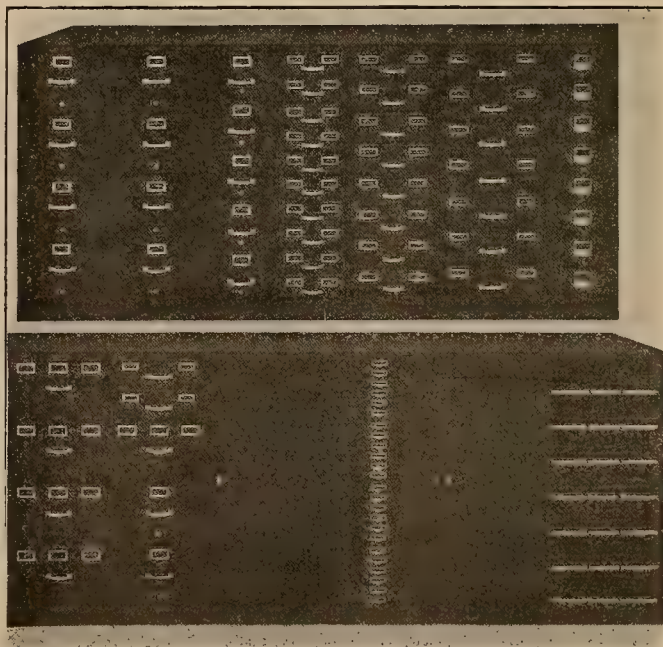
often differ several inches in depth, which is one cause for differing prices. There are two distinct styles, one in which the drawers are fastened to-

gether, with standard cabinet of four drawers in height as a unit, and the other style which has removable sides or top as desired so that expansion may be made without the extra cost of these portions being duplicated. All drawers are ball-bearing, so that they roll very easily even when the drawer is full, they are furnished with a compressor or



Guides and folders may be purchased with tabs cut according to these illustrations. The tabs may be in plain manila, covered with celluloid, or metal tipped with names inserted.

follow-up block to push papers forward and keep them nearly in an upright position, they have neat, very plain substantial brass handles and label holders on the front, and attempts are made to make them dust proof as well as fire proof. Any make of cabinet may be furnished with locks, to prevent loss of papers by those going to the files when the attendants are not there, and in case of fire when the cabinets fall forward, to prevent the drawers from opening. Each of these points should be examined when purchasing a cabinet.



Two batteries of files showing how various standard sizes may be combined to meet demands.



## The Telephone In Chinatown

BY C. L. HUYCK

(San Francisco's Chinatown is famous the world over. The following interesting account of how this picturesque corner of a great city avails itself of up-to-date conveniences, modified to harmonize with the setting, is here told by a member of the Western Electric Company in San Francisco.—The Editor.)

San Francisco's Great Fire of 1906 drove over Chinatown, too, and from its ruins there rose a pillar of smoke that was huger than all the fumes of all the incense that had ever burned before its josses. It was immediately rebuilt, however, and so individual are the Chinese that, although the five-barred



The Chinatown Exchange is Chinese in architecture to harmonize with the surroundings, and the interior is also finished in Oriental style.

flag of New China has displaced the Yellow Dragon, the new Chinatown needs but the lacquer of time to resemble the old.

Although the Chinaman is wedded to customs that date back to Confucius, he does not scruple to patronize modern conventions. Among these is the telephone. So numerous were the Chinese subscribers and so peculiar the demand of their service, that a special exchange in their quarter became necessary. With a rare sense of artistic fitness, the Pacific Telephone & Telegraph Company decided to construct it in harmony with its surroundings and in conformity with the immemorial rules of Chinese architecture. The result is one of San Francisco's show places and perhaps the only consistent example of Chinese architecture outside of its native land.

### Architecture in Keeping —

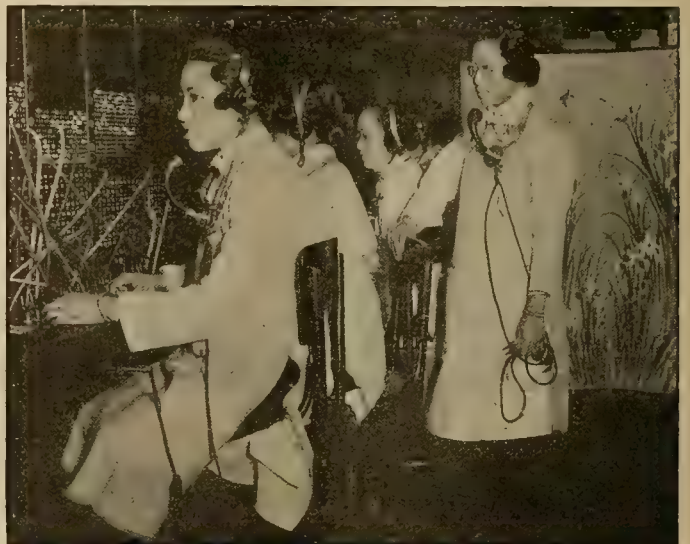
In this exchange, with its pagoda tower and prowlike balconies, each feature of construction is dictated by precedent. The several roofs were not added by ostentation or conscientious carpenters, but because the Chinese consider that the dignity and social position of the inmates of a house is in direct proportion to the number of roofs sheltering

them. The retrouse balconies are designed to shoot rain-water free from the building in winter and shield it from the direct rays of the sun in summer. The supporting columns have no capitals or bases and are as round and as red as giant firecrackers. Even the concrete foundations correspond to the stone platforms upon which the Chinese construct their buildings to protect them from dampness.

You cross the threshold into a soft and subdued light that would befit a temple. You almost expect to see the blue-robed bonze or hear the boom of a deep-toned gong. For the window glass, instead of being clear plate or stained, is of a delicate rose-gray, in imitation of those oyster shell linings that serve the Chinese in lieu of glass. The interior woodwork is in polished ebony, inset with panels of vermillion and gold. Upon these panels are depicted rampant dragons with claws, forked tongues and curving tails.

### The Switchboard —

At the end of the single large room is a plate glass partition. From behind it comes an intermittent sound such as you hear when the stockboy is



Each of the operators in the Chinatown Exchange is a graduate of a San Francisco public school, and must possess special abilities since most of the calls on this exchange are by name, not by number.

counting out No. 51½ knobs into a barrel. And then we remember that this building, which might be the Mount Vernon of some Manchurian Father of His Country, is built to contain the intricate and sensitive mechanism of a telephone exchange, and that the xylophone-like sounds that we hear are but the Chinese equivalents for "Number, please," and "Line is busy." Passing behind the curtained glass partition, we find the nerve-center or ganglion of the exchange; an eight-position switchboard, finished in polished ebony and ornamented with characteristic scrollwork, like the booths and desks of the outer



office. The operators are all Chinese girls, dressed in their rich and colorful costumes, and looking as though they had just stepped out of the scenery of some Chinese porcelain plate. There are thirteen operators in all for the various day and night shifts; during the small hours of the morning the board is handled by a boy. Exigencies of language demand that each operator be familiar with several native dialects as well as with English, because unwieldy China is a swarming babel of tongues, often unintelligible to natives of a distant province. Exigencies of service require that each operator memorize names, numbers and addresses, because the bulk of the calls are by name and not by number. To be an operator in this exchange, then, requires an unusual degree of intelligence and skill. It is not surprising to learn that each operator is a graduate of a San Francisco public school, with a record standing therein.

Mr. Loo Kum Shoo is the manager; a graduate of the University of California and a man of exceeding tact and courtesy. He is ably assisted by Mr. Sing.

#### A Busy Centre —

Thirteen hundred and fifty-six lines serve the ten thousand Chinese population centered about the

exchange. These 1356 lines are about equally divided between business and residence subscribers. The board handles an average of 8,700 calls per day, nearly all of which is inter-Chinatown service. There are, however, about 900 incoming outside calls per day and about 600 outgoing. An unusual proportion of these latter are long-distance calls, for the influence of generations of mouth-to-ear trading is unbreakable.

Another peculiarity of the service is the fact that there are absolutely no party lines in Chinatown. Though scrupulously honest—so much so that Chinese are highly prized as cashiers in native banks throughout the Orient and East Indies—the Chinaman is very secretive by nature and demands an individual line.

Before leaving we stop once more beside the board. It is now eleven o'clock in the morning; the rush hour is on, and all six operators are hard at it, snapping in plugs, yanking out cords, and chattering away with the cumulative effect of a jazz orchestra, an occasional English sentence cutting crisply through the jargon. It is difficult to believe that ordinary buying and selling, gossiping and "queen-ing" are going on in such a setting. This must, we think, be the board that handles the hurry-up calls from Aladdin's Lamp.

## Essentials of Esperanto

BY W. R. DAINGERFIELD

(Following is a continuation of the Esperanto grammar being especially compiled for the Journal of Electricity. The author, Judge Daingerfield, is one of the best known exponents of the "common commercial language" on the Pacific Coast.—The Editor.)

23. Kun escepto de mallongaj oftaj vortoj la plimulto de esperantaj vortoj estas komponitaj kaj sin-difinaj. Substantivoj, adjektivoj, verboj kaj derivitaj adverboj estas konstruitaj sur radikoj, kiu ne povas stari sola, sed devas havi unu el la gramatikaj finiĝoj jam nomitaj, antaŭ ol nomi sin vorto. La nekomponitaj vortoj povas stari solaj, kaj ankaŭ estas uzeblaj kiel radikoj. Ĉirkaŭ dek ses gramatikaj finiĝoj, ses prefiksoj, dudek kvin sufiksoj, cent kvindek-ok primariaj (nekomponitaj) vortoj kaj du mil radikoj konsistigas la vortliston de la ĉiutaga vivo, kaj ekvivalentas nekredible grandan nombron da vortoj. Radikoj jam troveblaj en la ĉefaj eŭropaj lingvoj estas memfakte esperantaj, nur konformigante al la sistemo de laŭsona alfabetumado karakteriza al Esperanto. Radikon oni ofte skribas kun apostrofo aŭ streketo por montri, ke ĝi ne estas kompleta vorto.

24. Doktoro L. L. Zamenhof, elpensinto de Esperanto, verkis unuan leglibron, nomitan Ekzercaro, kaj stilolibron, nomitan Krestomatio, kiel normigilojn por la lingvo. Tiu ĉi lasta enhavas tricent dek ses paĝojn da ĉia prozo kaj ducent okdek kvar paĝojn da versaĵo. Niaj ekzercoj enhavas frazojn el tiuj ĉi verkoj kaj aliaj fontoj.

25. "Patro" (**pah-tro**), father, estas komponita el la radikoj "patr" kaj la noma finiĝo **-o**. Aliigante la finiĝon, ni havas "patra," paternal, apartena aŭ rilata al patro. Ĉiun vorton oni povas ŝanĝi el unu

23. With the exception of short frequent words, most Esperanto words are composite and self-defining. Nouns, adjectives, verbs and derived adverbs are built upon a root or radical, which cannot stand alone, but must have one of the grammatical endings already named, before it can be called a word. The non-composite words can stand alone, and are also used as radicals. About seventeen grammatical endings, six prefixes, twenty-five suffixes, one hundred and fifty-eight primary (non-composite) words and two thousand radicals make up the vocabulary of everyday life and are equivalent to an incredibly large number of words. Radicals already found in the principal European languages are ipso facto Esperanto roots, merely conforming to the system of phonetic spelling characteristic of Esperanto. A radical or root is often written with an apostrophe or stroke, to show that it is not a complete word.

24. Dr. L. L. Zamenhof, the inventor of Esperanto, wrote a primer called Ekzercaro (Ekzertsahro), and a style-book called Krestomatio (Kress-to-mah-tee-o), as standards for the language. This latter work has three hundred and sixteen pages of all kinds of prose and two hundred and eighty-four pages of verse. Our exercises will contain sentences from these works and other sources.

25. "Patro" (**Pah-tro**), father, is composed of the radical "patr" and the noun-ending **-o**. By changing the ending we get "patra," paternal, belonging to or relating to a father. Every word can



vortspeco en alian, simple ŝanĝante la finiĝon, kie ajn la logiko permesas.

26. La sufikso **-in** signifas virinseksulo. Do, se ni konas la vortojn anglajn "brother, lion, ox, horse" kaj "king," jam ankaŭ en Esperanto, tiam ni ne estas devigataj lerni duan aron da vortoj por la kunrespondaj: "sister, lioness, cow, mare" kaj "queen."

27. Leono estas besto. Rozo estas floro, kaj kolombo estas birdo. La ŝafino apartenas al Teodoro. La patrino estas sana. La frato estas tajloro. Kie estas mia libro? Ĝi estas sur la tablo.

28. En Esperanto kaj multaj lingvoj oni uzas "la," antaŭ vortoj signifantaj parencojn kaj partojn de la korpo, kie la angleparolantoj uzus "mia, via, lia, ŝia, sia," ktp. Sed se estus necerte, kiun oni aludas, tiam same, kiel en la angla, oni uzus la laste nomitajn, supre.

29. La infano jam ne ploras. La vorto "jam," already, estas kunulo por "ankoraŭ," still. "Jam" pensnuancigas fermitan, finitan aferon, kaj "ankoraŭ" pensnuancigas malferman aŭ estontecan aferon aŭ influon. Tial "jam ne ploras" signifas "no longer cries." Oni povas ankaŭ diri "ne ploras plu."

30. Jen estas la pomo, kiun li trovis. "Jen" estas adverbo, sed estas multokaze tradukebla per "Here is, there is, here, there, behold," laŭ la konteksto. "Kiun" estas akuzitiva, estante komplemento de la verbo "trovis."

31. Resti kun leono estas danĝere. En Esperanto la adjektivoj finiĝas en **-a**, kaj iras kun substantivoj kaj pronomoj, kiel anglolingve, sed ne kun verboj. La adverba finiĝo **-e** similas al la angla **-ly**, kaj plejofte montras "manieron." Do en Esperanto ni diras "tu stej ŭjth ej lajon izz dejnĝeruslj," aŭ estas "dejnĝ'r-mann'r." Sed: Resto kun leono estas danĝera. Erari estas home, pardoni estas die. Homo, homa, home; dio, dia, die.

32. La dentoj de la katoj estas akraj. En Esperanto la adjektivoj prenas **-j** kaj **-n**, same kiel la nomvortoj, al kiuj ili apartenas.

33. Kiu kuraĝas rajdi sur leono? La radiko de la verbo "kuraĝas" estas "kuraĝ," kiu estas difinita en la oficiala Zamenhofa vortarlibro per sia adjektiva difinaĵo, kiel "kureĝus"—kuraĝa. Tial pro oportuneco la radiko estas nomita, kiel adjektiva. Ŝanĝinte **-a** en **-i**, ni ricevas verbon, "esti kuraĝa," to dare.

34. Jen kuŝas la ĉapelo de la patro. La poseda aŭ genitiva kazo estas esprimata per **"de."**

be changed from one part of speech to another by merely changing the ending wherever logic permits.

26. The suffix **-in** means female. Therefore if we know the words "frato," brother; "leono," lion; "bovo," ox; "ĉevalo," horse; and "reĝo," king, we are not compelled to learn a second array of words for the corresponding sister, "fratino"; lioness, "leonino"; cow, "bovino"; mare, "ĉevalino"; and queen, "reĝino."

27. "A lion is an animal. A rose is a flower, and a dove is a bird. The ewe belongs to Theodore. The (my, your, his, her, etc.) mother is well. The brother is a tailor. Where is my book? It is on the table."

28. In Esperanto and many languages, "the," **la**, is used before words meaning a relative or a part of one's body, where a person speaking English would use "my, your, his, her," etc. But if it should be uncertain to whom or to what the speaker referred, the possessive pronouns would be used, as in English.

29. "The child no longer cries (already not cries)." The word "jam," already, is a companion-word for "ankoraŭ," still. "Jam" imports a closed, finished matter, and "ankoraŭ" imports an open affair or one relating to the future. Therefore "jam ne ploras" means "no longer cries." One can also say, "ne ploras plu" (not cries further).

30. "Here is the apple that he found." "Jen" is an adverb but is often translated by "here is, there is, here, there, behold"—according to the context. "Kiun" is in the accusative case because it is the object of the verb "trovis," found.

31. "To stay with a lion is dangerous(ly)." In Esperanto adjectives end in **-a** and go with nouns and pronouns as in English, but not with verbs. The adverbial ending **-e** resembles the English **-ly**, and generally shows "manner." So in Esperanto we say "To stay with a lion is dangerously," or is "danger-manner." But "A stay with a lion is dangerous." "To err is human(ly); to forgive, divine (ly)" Homo," a human being; "homa," human; "home," humanly, in a human manner. "Dio," a god; "dia," divine, godlike; "die," divinely.

32. "The teeth of cats are sharp." In Esperanto adjectives take **-j** and **-n**, like the nouns and pronouns to which they belong.

33. "Who dares to ride on a lion?" The root or radical of the verb "dares" (kuraĝas) is "kuraĝ," which is defined in the official Zamenhof dictionary by means of its adjectival definition, "courageous" (kuraĝa). Therefore for convenience the radical is called adjectival. Having changed **-a** into **-i**, we get a verb "to be courageous, to dare" (kuraĝi).

34. "There lies father's hat." The possessive or genitive case is expressed by **de**, of, from.



A plan drawn up by the Pacific Coast Section of the National Electric Light Association to illustrate graphically the organization of the Section's Publicity Committee.



## SPARKS—Current Facts, Figures and Fancy

(Scientists and inventors are as active as ever, some having discovered how to put everyone in the United States out of work, while others are designing clothing which would really be more appropriate for a future life. Also it is now no longer safe to say "Eggs is eggs," nor that a man cannot be seen in London and Paris on the same afternoon. Verily, the world will never starve for lack of wonders.—The Editor.)

A daily air service between London and The Hague and connecting with an express train leaving for Amsterdam will enable a business man to breakfast in Amsterdam, lunch in Paris, and dine in London all on the same day.

\* \* \*

A recent report on British food prices classifies eggs as follows: Fresh eggs, imported fresh eggs, preserved eggs, Chinese eggs. The first three divisions seem so inclusive as to make us wonder exactly what it is that puts Chinese eggs in a class by themselves.

\* \* \*

A unique arrangement for metering the water used for sprinkling and other purposes is employed at the city parks of a Southern California city. The meter is fastened on a wheelbarrow, and when in use is connected to the hydrant or faucet by a short piece of hose.

\* \* \*

Villages are being rebuilt from their own ashes in France. The debris from the former buildings is shoveled into a grinding machine, brick and stone are crushed in the grinder and then carried directly to the concrete mixer, while a pump draws water for mixing the concrete from a big shell hole.

\* \* \*

Over 2,000 children from the London, Eng., elementary schools attended a special film matinee, at which the rule of three, multiplication, division and arithmetic generally were demonstrated on the screen. The promoters claim that there is scarcely a subject taught in the schools that cannot be applied to the film.

\* \* \*

A Norwegian claims to have invented a substitute for pneumatic tires now used on motor vehicles. The invention involves the use of steel springs tangentially applied to the wheels, with an outer rim of solid rubber, steel, wood, or other material. The inventor claims that spring wheels, manufactured according to his designs, may be used on street cars and railway trains, as well as on lighter vehicles.

\* \* \*

Asbestos clothing for everyday wear is a recent suggestion—even a promise—from scientists. These garments would be cleaned by dropping them in the fire instead of in the washtub, in spite of the fact that they would be of fibre as fine as silk, and of varied colors. Our chief objection is that after taking so much trouble to perfect the electric washing machine, the electrical industry would have to turn round and invent some kind of handy portable

electric furnace, guaranteed safe for the home laundry.

\* \* \*

A patent on a new form of advertising has been secured in France. The method is to print in paler ink advertisements of all kinds over the reading matter of newspapers and other periodicals. Somehow we think the public will not relish arresting descriptions of automobile tires and patent can-openers all over a love scene.

\* \* \*

According to scientists the ordinary flow of the river at Horse Shoe Falls, Niagara, is 275,000 cubic feet per second, developing an unharnessed horsepower of approximately 5,000,000 or the power of 15,000,000 strong draft horses, each horse being confined to an eight-hour day. If it takes 10 able-bodied men to do the work of one draft horse, the potential work of the falls is that of 150,000,000 men, nearly half again the number of men, women and children in the United States.

\* \* \*

A recent device enables messages to be conveyed by heat rays for distances up to 12 miles. The analyst uses a thermopile at the focus of a parabolic mirror as the receiver, and an electric arc projector, covered by a special black glass screen coated with manganese peroxide as the source. This screen diminishes the total radiation by 50 per cent, but completely blocks visible rays, thus rendering the signaling a secret process. The receiver is also recommended for use at sea in detecting approaching icebergs.

\* \* \*

It is reported that a light has been perfected in Great Britain which far surpasses any existing arrangement of artificial light, and is the closest approximation to actual daylight ever accomplished. The apparatus consists of a high-power electric light bulb, fitted with a cup-shaped opaque reflector, the silvered inner side of which reflects the light against a parasol-shaped screen placed above the light. The screen is lined with small patches of different colors, arranged according to a formula worked out empirically by the inventor, and carefully tested and perfected. The light thrown down from the screen is said to show colors almost as well as in full daylight. A test was made with such articles as colored wools, Chinese enamels, pastels and color prints, each being subjected successively to daylight, ordinary electric light and the new light. Under the new light delicate yellows were quite distinct, indigo blues were blue, cobalts had their full value, and violets lost the reddish shade which they display in electric light.



## PERSONALS



**John B. Miller**, chairman of the board, Southern California Edison Company with headquarters in Los Angeles, is to act as chairman of the Convention Committee of the National Electric Light Association, which will be held in Pasadena, California, from May 18th to May 22nd of this year, according to a recent announcement of President R. H. Ballard. This is the most important committee of the convention, and the fact that it will be under the personal supervision of Mr. Miller, a man of national prominence as a financier and head

of a large public utility corporation, gives the assurance that the big working plan will be carried out in perfect detail under the guidance of an organizer and executive of experience and success. Arrangements for the convenience, comfort and entertainment of the delegates to the convention are well under way, and those who go to Pasadena will find that their desires have been anticipated in every detail. Already committees are arranging an attractive program in which entertainment and education are excellently blended. The Entertainment Committee is working on plans which will make it possible for delegates to see much of the distinctive California life and some of the novelties of the Far West, and for those interested in engineering and development features of the Pacific Coast to gain firsthand information from visits to some of the big hydro-electric power generating plants and to see others under active construction. These committees have been designated namely, Transportation, Registration, Entertainment, Whips, Program, Publicity and Farewell. The Convention Committee of which Mr. Miller is the head will have general supervision over all of the other committees and will endeavor so to arrange the work that it will give the visitors the maximum of time for their duties and for enjoyment. In announcing Chairman Miller's appointment, just before leaving for New York on January 10th, his second trip since the last convention, President Ballard added that every indication points to a very large attendance at the Pasadena convention, and that he urged all who contemplated the visit to make their registrations as early as possible.

**A. S. Moody** of the General Electric Company, Portland, visited in Seattle recently.

**Harry Turner**, general manager of the Montana Electric Company, is a recent San Francisco visitor.

**F. O. Broili**, chief engineer of the Nevada Railroad Commission, is a recent visitor in San Francisco.

**H. S. Perkins**, Pacific Coast representative of Eastern insulator manufacturers, is visiting the Eastern factories.

**F. N. Buzzell** of the Buzzell Electric Works, San Francisco, leaves shortly for an extended business trip to the East.

**R. D. Street**, superintendent of distribution of the Western Electric Company, New York, is visiting Pacific Coast branches of his company.

**D. F. Anderson** has resigned as superintendent of distribution of the Washington Water Power Company and gone into business for himself at Spokane.

**Col. Frank Mears** has been appointed chairman and chief engineer of the Alaskan Engineering Company. **William C. Edes** is the consulting engineer.

**V. S. McClatchy**, publisher of the Sacramento "Bee," addressed the Foreign Trade Club of San Francisco January 7th on "Preservation of Peace on the Pacific by Radio News Service."

**James Lightbody**, publicity agent of the British Columbia Electric Railway Company, Limited, is a recent California visitor both in San Francisco and Los Angeles, and expects to spend three weeks in visitation.

**John H. Allison**, formerly of the Pittsburgh Bridge and Iron Company, has joined the Sales Engineering Department of the Celtic Products Company, producers of Sil-o-Cel insulating products in the Pittsburgh district.

**Bob Skeen**, proprietor of the Skeen Electric Company of Portland, suffered a very painful injury to one of his eyes as the result of a splinter of wood lodging in same. He is past danger now and will not lose his eye.

**C. S. Cheney** of San Francisco, secretary of the city plan commission of California, and for the last two years city plan consultant for Portland, is to be employed as city planning expert for the city of Spokane, Wash.

**Franklin K. Lane**, Secretary of the Interior, has submitted his annual report to the President, recording a year of achievement. It is reported that Mr. Lane will soon resign his cabinet post to enter the commercial field in New York City.

**J. C. Clark**, associate professor of electrical engineering at Stanford University, is on his sabbatical year's leave from the university and is doing special research work for the General Electric Company, with headquarters in San Francisco.

**Howard Angus**, secretary of the California Cooperative Campaign, has returned to San Francisco from Los Angeles, where he succeeded in making a permanent feature of the "electrical section" in the newspapers of the southern metropolis.

**John H. Rosseter**, who has been director of operations for the United States Shipping Board for the last two years, has returned to San Francisco where he will resume his duties as vice-president and manager of the Pacific Mail Steamship Company.

**George F. Sever**, consulting engineer, who as a major in the army spent considerable time on the Pacific Coast, is now with the engineering firm of Jackson & Moreland in Boston, Mass., doing general engineering work and also taking up special problems.

**Dr. I. Nakahara**, director and chief engineer of the Tokyo Electric Light Company, was nominated one of the advisers to the representatives of capitalists to be sent to the Labor Conference at Washington, D. C. Dr. Nakahara is the president of the Nihon Electrical Industrial Association.

**G. A. Richardson**, formerly superintendent of the street railway system of Seattle, when the system was owned by

the Puget Sound Traction, Light & Power Company, has been elected vice-president of the Philadelphia Rapid Transit Company. Mr. Richardson left Seattle last July to become transportation manager for the company. His new position carries with it the complete charge of all operating departments, including the rolling stock, shops and buildings, overhead and track system and the power system.



His many friends in the electrical industry on the Pacific Coast will welcome the news of his important responsibilities in his new location.



W. G. Vincent, valuation engineer for the Pacific Gas & Electric Company, is the new chairman of the San Francisco Section of the American Institute of Electrical Engineers. One of the interesting and helpful problems that have been undertaken in this season's program is the extending of the limits of the district tributary to the San Francisco Section and the findings of Mr. Vincent and his executive committee will undoubtedly prove of aid to other sections in the West.



The great distances between engineering centers in the West have in cases isolated engineers and kept them from active contact with Institute work. Under the proposed plan of the San Francisco Section an enlarged area will be asked for particularly toward the northern part of the state, in order to bring actively into touch with the section a number of members resident there and who would greatly benefit the local activities by their professional influence. It is believed that this widening of section activity in the West is well worthy of consideration in many other quarters where similar conditions prevail.

Samuel Kahn, vice-president and general manager of the Western States Gas and Electric Company at Stockton, California, has been elected president of a newly organized "Community Service" which, among other things, took charge of the installation of a community Christmas tree at Stockton.

A. J. Frey, the present district manager of the Southern Pacific district, has consented to remain in his capacity of Fleet Corporation representative in the Western district. It is a great source of gratification to the electrical industry of the coast to learn that Mr. Frey is to remain in charge of this work.

Major Harry H. Kluegel, who was formerly connected with the Mt. Whitney Light and Power Company and who during the war did good service in camp construction work in the West, is now connected with the Walter Reed General Hospital, Washington, D. C., as abilities officer and construction quartermaster.

E. W. Hughman, honorary secretary of the Indian Society of Engineers of Calcutta, India, is at present in New York, where he is making one of his annual visits to the United States. Mr. Hughman usually spends some time each year on the eastern coast. He has, however, announced his intention of coming by the western route on his next year's visit.

Franklin W. Loomis has joined the staff of The Society for Electrical Development. His many years' experience, covering the contracting, manufacturing and central station fields, will prove of great value in his new position. He has recently come to New York from Dallas, Texas, where he filled the position of sales manager for the Dallas Power & Light Company.

S. J. Lisberger, engineer of San Francisco distribution with the Pacific Gas and Electric Company, left for the East on January 11th to attend a meeting of the Apparatus Committee of the National Electric Light Association at Louisville, Ky. Mr. Lisberger also expects to visit some of the important factories in the vicinity, returning to San Francisco in about two weeks.

R. H. Ballard, president of the National Electric Light Association, passed through San Francisco recently on his way East, where he goes to perfect final arrangements for the annual convention of the association which is to be held

in Pasadena, California, May 18-21, 1920, and which will constitute the most significant gathering of electrical men anywhere in the nation during 1920.

C. R. Hunt, of the Robbins and Myers Company, is visiting various points on the Pacific Coast on his way to Arizona.

G. W. MacNichols, of the Bluebird Electric Washing Machine Company, has recently come out from St. Louis to take charge of one of the Bluebird stores in San Francisco.

Curt C. Davis, in charge of the electrical department of the Turner Hardware Company, Modesto, California, has been visiting in the San Francisco region for some days. No successor has yet been appointed to Mr. Davis as field representative of the California Electrical Cooperative Campaign in the Bay district.

E. R. Stauffacher of the Southern California Edison Company has been appointed to the position of protection engineer of that company to fill the vacancy created by the resignation of G. E. Armstrong. Mr. Stauffacher has been in the employ of the Southern California Edison Company for the past eight years and during that time has filled positions as engineer of underground distribution and assistant power engineer.

A. C. Jewett has returned to the United States after some five years spent in the Orient for the General Electric Company and is at present visiting in Fresno, California. In a recent letter to the editor of the Electrical World, published in that journal December 27th, Mr. Jewett tells in an interesting manner of his experiences in supervising the construction of a 1500-kw. hydroelectric plant 80 km. north of Kabul, at Jabl-us-Siraj, Afghanistan.

J. W. Redpath, secretary of the California Association of Electrical Contractors and Dealers, has been putting in the last two months in important organization work in Southern California. He has assisted in the establishment of local associations in San Diego, Imperial Valley, Orange County, the "Orange Belt" (Covina to Hemet) and Long Beach, and has also spent several weeks in and about Los Angeles. After the State Association meeting at Sacramento, January 17th, Mr. Redpath will go to Santa Barbara to aid the organization of a local section there.

Percy A. Cupper, State Engineer of the State of Oregon, has gone to attend the Reclamation and Irrigation conference in Washington, D. C. He will attend the executive committee meeting of the Western Reclamation Association which opened on Jan. 14. The session was called by D. W. Davis, governor of Idaho and president of the reclamation association, and will be attended by the following executives: Bamberger, Utah; Carey, Woming; Shoup, Colorado; Larazolo, New Mexico; Campbell, Arizona; Hart, Washington; Boyle, Nevada; Davis, Idaho; and McDowell, Montana.

Clyde L. Chamblin, president of the California State Association of Electrical Contractors and Dealers, took up the

duties of that office at the beginning of the year. During 1919, he was the efficient executive of the San Francisco local association. Mr. Chamblin will preside at the first of the State meetings to be held at the Travelers' Hotel, Sacramento, on January 17th. It is planned to convene the monthly meetings at different cities throughout California, so that all the electrical contractors and dealers in the State may



have full opportunity to cooperate with their Association in its constructive work.



## Meeting Notices for Electrical Men

(Important San Francisco meetings which have taken place recently include those of the American Association of Engineers, the San Francisco Electrical Development League, the Engineers' Club, and the Electrical Contractors' and Dealers' Association. The annual dinner of the Electric Appliance Company was another notable gathering. The National Electric Light Association reports important committee meetings in a number of places.—The Editor.)

### San Francisco Electrical Development League

The San Francisco Electrical Development League at its first meeting of the year, on January 5th, listened to an address on "The Relation of Light to Safety," by Will J. French, member of the Industrial Accident Commission of the State of California. Mr. French reviewed briefly the provisions of the new Industrial Lighting Safety Orders, now in effect, and showed the conditions which the Commission is seeking to attain by their enforcement. He urged that the electrical industry cooperate with the Commission by informing manufacturers and other employers as to the provisions of the safety lighting code. At the conclusion of his talk, Mr. French answered questions from his auditors. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, spoke on the favorable attitude of the Pacific Coast Section, N.E.L.A., toward the lighting code and all measures which will make for conservation of labor. W. W. Hanscom, consulting electrical and mechanical engineer, acted as chairman of the day.

At this meeting of the League a special committee was appointed to look into the feasibility of holding a large Electrical Show in San Francisco in the near future. The committee was announced as follows: Henry Bostwick, R. M. Alvord, Clyde L. Chamblin, George Curtis, J. B. Black.

### Engineers Club of San Francisco

A. M. Hunt, consulting electrical and mechanical engineer, and one of the pioneer engineers of the West, having been the engineer of the Independent Electric Company of San Francisco, made an informal address to one hundred of the members and guests of the Engineers Club at noon on January 8. Mr. Hunt was a member of the Naval Consulting Board and also the Special Engineering Commission to France, and he gave some recollection of his experiences with those very important boards. At the time of the armistice Mr. Hunt was investigating the proposition of increasing the speed of transatlantic shipment by bettering the fire room practice of the ships engaged in this work. Had there been more time available this work would have increased the transportation abilities of the country by a considerable per cent, at the same time reducing the danger of submarine menace.

### A. S. M. E. San Francisco Section

The San Francisco Section of the American Society of Mechanical Engineers held its second general meeting of the 1919-1920 season on January 8th. The following papers were presented: "Production and Distribution of Oil Gas," by

W. M. Henderson; "Industrial Uses of Gas," by H. M. Crawford; "Use of Oil Gas for Manufacture and Heating of Rivets," by Letson Balliet. The meeting was preceded by an informal dinner.

### National Electric Light Association

President R. H. Ballard of the National Electric Light Association left Los Angeles on January 11th for another tour of the East in the interests of the organization, and to perfect arrangements for the convention of 1920 which will convene in Pasadena, California, on May 18th. At San Francisco he was joined by John A. Britton, chairman of the Public Policy Committee, who accompanied him on his trip. They were given a complimentary dinner by the Electrical Development League of that city on January 12th, which was attended by the prominent electrical men of Central California. Much enthusiasm was expressed concerning the convention and plans were outlined for the work preparatory to the convention which will be carried on during Mr. Ballard's absence.

At Salt Lake City Mr. Ballard met with Sidney R. Inch, vice-president and general manager of the Utah Power and Light Company, and attended a meeting of the prominent electrical men in that territory.

In Denver he meets with W. J. Barker, vice-president and general manager of the Denver Gas and Light Company, and Norman Read, general manager of the Colorado Power Company, and other prominent men of the industry,

to discuss the formation of a geographical section composed of the states of Colorado, Wyoming, and New Mexico.

At Omaha President Ballard will attend a meeting called by J. E. Davidson, general manager of the Nebraska Power Company.

M. H. Aylesworth, executive assistant to the president, will meet Mr. Ballard in Chicago and a meeting will be held at which Martin J. Insull, vice-president of the National Electric Light Association, John G. Learned, chairman of the commercial section, and George B. Foster, chairman of the vehicle section, and other prominent electricians will be present. Affairs of the national organization and the Pasadena convention will be discussed, after which Mr. Ballard, accompanied by Mr. Aylesworth, will leave for Cleveland and look over some interesting exhibits at the lamp works.

While in the East, President Ballard will attend several company sections, among which are those at Baltimore, Maryland, and Pittsburgh, Pennsylvania. The tentative plans

### BUILDERS OF THE WEST—LXIX



HENRY P. SUZZALLO

The West is proud of her universities and their accomplishments. Herbert Hoover, Franklin K. Lane and a host of others, today leaders in thought in national civic affairs and in engineering attainment, but bespeak the quality of the work of her sons, the product of Western universities. In the Northwest, the University of Washington is adding a certain something not only in high quality of academic attainment but in tie-in with civic affairs of the commonwealth it serves that marks this institution as a distinct type of helpfulness in the West. To Henry P. Suzzallo, president of the University of Washington, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his enduring work in university vision that is molding the vision of our engineers in embryo into new and more helpful ideals of service.



for his return trip to California include stops at Atlanta, Georgia, New Orleans, Dallas and San Antonio, Texas, and Albuquerque, New Mexico. He will attend the convention of the New Mexico State Association which will be held there February 16th to 18th, and leaving there will stop at Phoenix, where a big meeting of the Arizona electrical men will be held. From Phoenix he will return to his home in Los Angeles.

#### N. E. L. A., Portland, Oregon, Sections

The Portland and Oregon Sections of the National Electric Light Association held their regular monthly meeting on January 13th at 8 p. m. Dr. William Conger Morgan, professor of Chemistry, Reed College, was the speaker of the occasion. The meeting closed with an informal dance.

#### American Association of Engineers, Portland Section

The Portland Section of the American Association of Engineers held their regular meeting at 8 p. m., 408 Tilford Building, January 9th, 1920. A resolution was unanimously passed that the association would do everything in its power to fight any bill introduced in the special session of the Legislature, to repeal the law requiring professional engineers to register in the State of Oregon.

#### A. I. E. E., School of Engineering of Milwaukee

The first meeting of the newly organized School of Engineering branch of the American Institute of Electrical Engineers broke all records for attendance at its first meeting. There were 241 present. This seems to exceed all recorded meetings, Cornell being the next largest with 47. It has over 100 members enrolled in the Institute and 257 in the student branch. Dean John R. Ball presided. W. M. White, consulting engineer of the Allis-Chalmers Company and president of the Milwaukee Society of Engineers, delivered an address on the subject of "Hydro-Electric Development in America."

The School of Engineering of Milwaukee now has seventy-two members of its faculty board, or more than twice as many as a year ago. It has increased its buildings by the addition of two and its courses by the addition of three.

#### Joint Publicity Meeting

A joint meeting of the Northern California members of the Publicity Committee of the Pacific Coast Section, N. E. L. A., and the Advisory Committee of the California Electrical Cooperative Campaign, was held on Friday, January 9th, at the San Francisco Commercial Club. A profitable discussion was held upon ways and means of stimulating publicity in the newspapers of the State, in connection with the electrical pages which are being instituted, and a number of excellent suggestions were offered as to methods of securing more news items for the use of the press. The co-ordination of the efforts of the two bodies along these lines was planned. In following out the policy of interesting organizations in assisting the "publicity drive," it was agreed that Lee H. Newbert should urgently impress this matter upon the members of the San Francisco Electrical Development League, on "California Electrical Cooperative Campaign Day," January 26th.

Those in attendance at the meeting were: I. W. Alexander, H. W. Angus, F. E. Boyd, M. T. Dolman, Frederick S. Myrtle, Robert Sibley, Lee H. Newbert, R. M. Alvord, J. B. Black, P. Merrill, M. L. Scobey, C. L. Huyck.

#### ELECTRIC APPLIANCE COMPANY ANNUAL DINNER

The value of the personal touch applied particularly to inter-company relations was the outstanding feature of the annual dinner of the sales organization of the Electric Appliance Company, held in the Commercial Club on January 3. Not only was this point brought out in detail by the speakers, but it was largely apparent in the sincere goodfellowship which exists between the various men and between them and the officers of the company. It is to this that the stable growth of the organization is attributed, and because of it their motto, "We grow a little every day," carries a lesson.

As will be noted from the photograph, the triangular arrangement of the tables illustrates the company emblem. General Manager C. C. Hillis occupying the apex as toastmaster. In addition to the company employees, there were as guests, a goodly number of manufacturers' representatives with whom the company does business.



The annual dinner of the sales organization of the Electrical Appliance Company was attended by a number of men prominent in electrical circles in the West, and was a notably successful gathering.



**American Association of Engineers**

At the regular monthly meeting of the American Association of Engineers, San Francisco Chapter, held in the rooms of the Engineers' Club on the evening of January 6th, a number of matters of interest to that organization were brought up for discussion, among which were a set of resolutions to be acted upon by their board of directors at their next sitting. Of interest to central station companies was one point brought out by them in their resolutions, to the effect that as an association they would pledge themselves to lend the utility companies every assistance possible looking toward an increase in the revenue of the utility companies; the association being of the opinion that the compensation of engineers employed by utility companies was directly related to the revenue obtained by the respective companies.

Chief Engineer Murphy of the San Francisco Fire Department was called upon by the chairman, Mr. W. S. Woolner, to address a few words to the association. Chief Murphy brought out a number of very interesting points in connection with the fighting of fires in San Francisco. He stated that ninety-five per cent of the city was constructed of wood and was therefore a great fire risk.

The speaker of the evening, Mr. Stevens, chief of the Pacific Fire Prevention Bureau, made a forceful talk on this subject, with which he is so familiar and on which he is conceded to be the leading authority in the country. His particular topic was "The Relation of the Engineer to the Prevention of Fire." Mr. Stevens presented a number of lantern slides which clearly illustrated the hazards which may be observed in nearly every location, and, following his lecture, exhibited three reels of moving pictures which illustrated the work being undertaken by fire prevention bureaus in various cities.

The San Francisco Chapter of the association is making plans to open an office in the city and maintain a full-time secretary for the service of the members of the association.

**Electrical Contractors' and Dealers' Association**

The Electrical Contractors' and Dealers' Association of San Francisco held its first meeting of the year on January 2nd. Clyde L. Chamblin, retiring president, formally turned over the chair to T. J. Bennett, elected to the presidency for 1920. Important matters connected with the industry were considered, besides a number of proposed amendments to the by-laws. The president announced that throughout the year a member will at each meeting present a paper or ten-minute talk on electrical construction or some educational or engineering matter of interest to the membership.

The standing committees for the year were announced as follows:

Membership Committee: P. Decker (chairman), L. B. Hammond, R. D. de Journette.  
 Standardization Committee: E. E. Browne (chairman), S. Radelfinger, P. Schwartz.  
 Supplies Committee: C. L. Chamblin (chairman), C. J. Newbery, C. F. Butte.  
 Legislative Committee: C. H. Kenney (chairman), C. F. Butte, H. N. Nelson.  
 Finance Committee: E. P. Crowe (chairman), F. W. Buzzell, F. E. Waterhouse.  
 Retail Committee: J. F. Hetty (chairman), M. L. Scobey, W. D. Kohlwey.

**Oregon Association of Electrical Contractors and Dealers**

At the last meeting of the Oregon Association of Electrical Contractors and Dealers, it was decided to hold a monthly smoker and invite all those in and about Portland who are connected with the industry to enjoy their hospitality. The first one was held on the night of January 5th at the Crossroads Inn, where a chicken dinner was served as a preliminary, followed by two three-round boxing matches, a wrestling match and several special Oriental dances accompanied by a special jazz orchestra. There was an attendance of over a hundred and everyone expressed themselves as overjoyed with the smoker and expressed a determination of attending the next one.

## WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

**A. I. E. E.—WESTERN SECTIONS****National Officers**

President—Calvert Townley, Westinghouse Electric & Manufacturing Company.  
 Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.  
 Meetings—Monthly.

**Denver Section**

Chairman—Prof. H. S. Evans, Univ. of Colorado, Boulder.  
 Secretary—Robt. B. Bonney, Mountain States Tel. & Tel. Co., Denver, Colo.  
 Meetings—Third Saturday of each month, at the Shirley Hotel.

**Los Angeles Section**

Chairman—J. H. Cunningham, General Electric Co., Los Angeles.  
 Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.  
 Meetings—Second Tuesday of each month.

**Portland Section**

Chairman—W. D. Scott, Pacific Telephone & Telegraph Company, Portland, Ore.  
 Secretary—E. H. LeTourneau, Portland Railway, Light & Power Company, Portland, Ore.  
 Meetings—Monthly.

**San Francisco Section**

Chairman—W. G. Vincent, 445 Sutter St., San Francisco.  
 Secretary—Allen G. Jones, Rialto Bldg., San Francisco.  
 Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

**Seattle Section**

Chairman—G. E. Quinan, Puget Sound Traction Light & Power Co.  
 Secretary—Willis T. Batcheller, Seattle, Wash.

Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

**Spokane Section**

Chairman—George Nixon, Main and Lincoln Sts., Spokane.  
 Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.  
 Meetings—Third Friday of each month.

**Utah Section**

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.  
 Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.  
 Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

**Vancouver Section**

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.  
 Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

**A. I. E. E.—WESTERN BRANCHES****Idaho University Branch**

Meetings—First Wednesday evening of each month from October to June.

**Montana State College Branch**

Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.

Meetings—Third Friday of every month of the school year in the Electrical Bldg.

**Oregon Agricultural College Branch**

Chairman—Lawrence Fudge, Oregon Agr. College, Corvallis, Ore.  
 Secretary—Otto L. Cantrall, Oregon Agr. College, Corvallis, Ore.

**Stanford University Branch****State College of Washington Branch**

Chairman—Clarence E. Guse, Pullman.  
 Secretary—Ralph C. Guse, State College of Washington, Pullman.  
 Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

**Throop College of Technology Branch**

Chairman—Mark Sawyer, Throop Dormitory, Pasadena, Cal.

**University of California Branch**

Chairman—A. E. McMahon, University of California, Berkeley, Cal.  
 Secretary—D. D. Davis, University of California, Berkeley, Cal.

**University of Colorado Branch**

Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.  
 Secretary—Russell Otis, Throop Dormitory, Pasadena, Cal.

**University of Washington Branch**

Chairman—Jack Tolmie, Univ. of Washington, Seattle.  
 Secretary—Glen Walker, Univ. of Washington.  
 Meetings—Monthly, first Tuesday, Forestry Bldg.

### CONTRACTOR-DEALER ASSOCIATIONS

**National Association of Electrical Contractors and Dealers**

Chairman—W. Creighton Peet.  
 Secretary—W. H. Morton, 110 West 40th St., New York.  
 Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland, J. F. NePage, Seattle, Wash.



**British Columbia Ass'n Electrical Contractors and Dealers**

President—E. Brettell, Vancouver, B. C.  
Secretary—Capt. W. J. Conway, Vancouver, B. C.

Meetings—First Tuesday of each month.

**California Ass'n of Electrical Contractors and Dealers**

President—M. A. De Lew, 180 Jessie St., San Francisco.

Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

Meetings—Monthly.

**Denver Electrical Contractors' Association**

President—E. C. Headrick.

Secretary—C. N. Shannon, 227 Coronado Bldg.

Meetings—2nd and 4th Monday nights of each month.

**Electrical Contractors & Dealers of Salt Lake City**

President—G. W. Forsberg.

Secretary—E. H. Eardley, Eardley Bros., Salt Lake City.

**Electrical Contractors and Dealers Ass'n of San Francisco**

President—T. J. Bennett, Rex Electric Co., San Francisco.

Secretary—Louis R. Ardouin, San Francisco.

Meetings—Friday, 12:30; New Call Bldg.

**Monterey Bay Electrical Contractors and Dealers**

President—W. Cox, Santa Cruz.

Secretary—D. K. Noggle, Monterey.

**Nevada Ass'n of Electrical Contractors and Dealers**

President—F. V. McAvoy, 138 N. Canter St., Reno.

Secretary—R. W. Shearer, 215 Sierra St., Reno.

Meetings—Twice a month, 15th and 30th.

**Oregon State Ass'n of Electrical Contractors and Dealers**

President—R. C. Kenney, 388 Burnside street, Portland.

Secretary—U. P. Mundt, Portland, Ore.

**Portland Local Ass'n of Electrical Contractors and Dealers**

President—Roy C. Kenney, Portland.

Secretary—H. C. Jones, 306 Concord Bldg., Portland.

Meetings—Alternate Mondays at Imperial Hotel Grill.

**Sacramento Section, California Electrical Contractors & Dealers' Association**

President—W. H. Gribble, Sacramento.

Secretary—H. Berg, Sacramento.

**Southern California Electrical Contractors and Dealers**

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.

Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.

Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

**Washington Ass'n of Electrical Contractors and Dealers**

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.

Secretary—Forrest E. Smith, Seattle, Wash.

Meetings—Quarterly—second Thursdays of March, June, September and December.

**JOBBERS' ASSOCIATIONS****Electrical Supply Jobbers Association**

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.

Meetings—Semi-annual.

**Pacific Coast Electrical Supply Jobbers**

President—T. E. Bibbins, 575 Mission St., San Francisco.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—Quarterly.

**Electrical Credit Ass'n of the Pacific Coast**

President—J. H. Zweifel, Electrical Appliance Co., San Francisco.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—annually; San Francisco; May.

**OF ELECTRICAL INTEREST****Alameda County Electrical Club**

President—George Drew, Pacific States Electric Company, Oakland, Cal.

Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

**California Electrical Cooperative Campaign**

Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.

Secretary—Captain Howard Angus, New Call Bldg., San Francisco.

**Colorado Electric Light, Power and Railway Association**

President—E. A. Phinney, Jefferson Co. Power & Light Co.

Secretary-Treasurer—F. P. Safford, Denver Gas & Electric Co., Denver, Colo.

**Electric Cooperative League of Los Angeles**

President—Ralph B. Clapp, San Fernando Bldg., Los Angeles.

Secretary-Treasurer—Carl M. Heintz, Westinghouse Electric & Mfg. Co., Los Angeles.

**Electric Metermen's Association**

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.

Secretary—A. E. Coney, Great Western Power Company, San Francisco.

Meetings—About every 60 days.

**Illuminating Engineering Society**

President—S. E. Doane.

Secretary—Clarence L. Law.

Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.

Meetings—First Tuesday each month.

**National Electric Light Association**

President—R. H. Ballard, Southern California Edison Company.

Secretary—T. Comerford Martin, 29 West 39th St., New York.

**Nebraska Section, N. E. L. A.**

President—T. H. Fritts, Central Power Company, Grand Island, Neb.

Secretary-Treasurer—B. H. Conlee, Beatrice Gas & Electric Company, Beatrice, Neb.

**Nevada Section, N. E. L. A.**

Chairman—Geo. A. Campbell, Reno, Nev.

**New Mexico Electrical Association**

President—D. W. Morgan, Las Cruces, N. M.

Secretary—Charles Twogood, Albuquerque, N.M.

Meetings—Annually, in February.

**Northwest Electric Light and Power Ass'n**

President—John B. Fisk, Washington Water Power Company.

Secretary—L. A. Lewis, Spokane, Wash.

Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

**Pacific Coast Section, N. E. L. A.**

President—A. E. Wishon, San Joaquin Light & Power Corporation, Fresno, Cal.

Secretary—A. H. Halloran, Journal of Electricity, Electric Bldg., San Francisco.

Meetings—Annually, in April.

**Portland Section, N. E. L. A.**

Chairman—F. H. Murphy, Portland Railway, Light & Power Company.

Secretary—Geo. Bowen, Portland, Ore.

**San Francisco Electrical Development League**

President—E. O. Shreve, General Electric Co., San Francisco.

Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

**Southwestern Electrical and Gas Association**

President—W. A. Sullivan, Shreveport, La.

Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

**Synchronous Club**

Secretary—H. N. Beecher, City Hall, Los Angeles.

**Telephone and Telegraph Society of the Pacific Coast—San Francisco Section**

President—W. H. Brommage, Pacific Tel. & Tel. Co., San Francisco.

Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

**MECHANICAL ENGINEERS****National Officers**

President—Mortimer E. Cooley, Electrical Engineering Dept., Ann Arbor, Mich.

Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

**Los Angeles Section, A. S. M. E.**

President—Charles H. McGuire.

Secretary—T. J. Royer.

Meetings—Quarterly.

**San Francisco Section, A. S. M. E.**

President—W. F. Durand, Stanford University, Palo Alto, Cal.

Secretary—Jas. A. Kinkead, Rialto Bldg., San Francisco.

Meetings—Quarterly.

Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

**ENGINEERS' CLUBS****Colorado Engineering Council**

President—Arthur Ridgway, 810 Equitable Bldg., Denver.

Secretary-Treasurer—Robert J. Grant, 614 Interstate Trust Bldg., Denver.

**Engineers' Club of Oakland**

President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

**Engineers' Club of Sacramento**

President—George S. Nickerson, 914 Forum Bldg., Sacramento.

Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

**Engineers' Club of San Francisco**

President—Ely C. Hutchinson, Pelton Water Wheel Co., San Francisco.

Secretary—Allen G. Jones, Rialto Bldg.

Annual Meeting: October.

**The Engineers' Club of Seattle**

President—H. E. Horrocks, Seattle, Wash.

Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.

Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

**Idaho Society of Engineers**

President—W. H. Gibson, Mountain Home, Idaho.

Secretary—Ira F. Shaffner, Boise, Idaho.

**Joint Committee Technical Societies of Los Angeles**

Chairman, George A. Damon, San Fernando Bldg., Los Angeles.

Secretary—W. K. Barnard, 705-6 Central Bldg., Los Angeles.

**Los Angeles Chapter, American Ass'n of Engineers**

President—E. G. Shibley.

Secretary—A. L. Harris, Central Bldg., Los Angeles.

**Oregon Chapter, American Ass'n of Engineers**

President—W. H. Marsh.

Secretary—R. W. Barnes.

**Oregon Society of Engineers**

President—John W. Cunningham, 414 Spalding Bldg., Portland.

Secretary—Orrin E. Stanley, Box 973, Portland.

Meetings—Annual: First Monday in February.

Monthly: Third Thursday of each month.

Third Thursday of each month.

**Pacific Northwest Society of the American Ass'n of Engineers**

President—S. D. Clinton, Vulcan Iron Works.

Secretary—J. A. Hopkins, Seattle Boiler Works.

**San Francisco Chapter, American Ass'n of Engineers**

President—William S. Wollner.

Secretary—A. G. Mott.

**United Engineering Societies of San Francisco**

Chairman—C. D. Marx, Stanford University.

Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

**Utah Society of Engineers**

President—Leonard Cahoon.

Secretary—Wm. H. Kelsey.

Meetings—3rd Wednesdays except May, June, July and August.

Annual banquet—May.

**MISCELLANEOUS****American Ass'n for the Advancement of Science—Pacific Division**

President—John Campbell Merriam, University of California; Acting Chairman National Council of Research.

Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.

Meetings—Annual.

**Foreign Trade Club**

President—W. H. Hammer, Monadnock Bldg.

Secretary—Aubrey Drury, Journal of Electricity, Rialto Bldg.

Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

**Portland Section A. S. C. E.**

President—P. H. Dater, Eng. U. S. Forestry Service.

Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.

Meetings—At call of president.

**Spokane Engineering & Technical Ass'n**

President—L. K. Armstrong, A. S. M. E.

Secretary—A. D. Butler, City Engineer, Spokane, Wash.

Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

**Pacific Coast Gas Association**

President—A. B. Day, Los Angeles Gas & Electric Co.

Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

**Society for Promotion of Engineering Education**

Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.



## HAPPENINGS IN THE INDUSTRY

### SUPREME COURT DECISION

The United States Supreme Court has decided that the companies engaged in the business of transporting oil through pipe lines in California are common carriers and public utilities subject to regulation by the Railroad Commission. The decision is of great importance to California, as it gives the State, through the Railroad Commission, control of the transportation of oil by pipe line with authority to fix rates for the service and regulate the practices of companies engaged in the business.

In 1913 the California legislature passed a statute known as the "Oil Pipe Line Act," in which all the companies engaged in transporting oil by means of pipe line were declared to be common carriers and public utilities subject to regulation by the Railroad Commission. The Commission instituted an investigation to determine what companies came within this definition, summoning the oil companies to appear and present evidence as to their oil transportation business. The Commission found that the Producers Transportation Company came within the provisions of the Oil Pipe Line Statute. The company was accordingly ordered to file with the Commission its rates, rules and regulations for the transportation of oil.

An appeal was taken to the California Supreme Court by the Producers company which operates from the oil fields of Coalinga, Kern, McKittrick and Maricopa to Port Harford on the coast of San Luis Obispo County. The State Court sustained the Commission, holding that the Commission had the right, under the Constitution and the Oil Pipe Line Act, to declare the company a common carrier. An appeal from this decision taken to the high court at Washington resulted in the decision as indicated above.

### POWER DEVELOPMENTS AND INSTALLATIONS

In reviewing power developments as indicated by demands for equipment, the General Electric Company states as follows:

During the early part of the year there was very little activity on hydro-electric projects due to war and general economic conditions. A few small plants were installed and additions made to existing stations to take care of increase in load that could not be handled otherwise. But by the middle of the year the activity in this line became marked in the number of requests for complete new stations, this being more particularly noticeable in the West.

Among the new and larger projects for which the General Electric Company have received orders are included the Niagara Falls Power Company, the Southern California Edison Company, Great Western Power Company, Consumers Power Company, and the New England Power Company.

An important step in the increase in transmission voltages has been taken in the new Caribou Development of the Great Western Power Company, which is installing equipment and transmission line for operation at 165,000 volts. Two units are included in the initial order, the ultimate capacity of the station being six units.

The Southern California Edison Company have for some time been making estimates on developing various projects to take care of their rapidly increasing load and have finally decided to install their Kern River No. 3 development and orders were placed with the General Electric Co. for the complete electrical equipment of this installation. Two units are to be installed, at present the generators being rated 17,500 kva.-600/500 rpm.-11,000 volts with direct connected exciters. These generators are designed so as to be capable of operation at either 50 or 60 cycles, and 7-Transformers are included rated-WC-50/60 cycles-5833 kva.-10,000/11,000-75,000 volts-Y connected on the high tension side. Complete switching equipment consisting of high and low tension switches and benchboard type of main control board was also included. At the Eagle Rock substation a 30,000 kva.-600 rpm.-6600 volt synchronous condenser is to be installed complete with transformers, exciter set and switchboard equipment.

### PUBLIC UTILITY RATES

In connection with the application of the San Joaquin Light and Power Corporation for a review of its rates, the following resolutions have been forwarded to the Railroad Commission:

Resolution adopted by Rotary Clubs of Fresno

Whereas, The San Joaquin Light & Power Corporation, a Corporation engaged in the business of serving electricity in the San Joaquin

Valley and in Fresno and the territory adjacent thereto, is applying to your honorable body for a review of its rates, on January 5th; and

Whereas, The Rotary Club of Fresno is composed of the representatives of the different business interests, we desire to express to the Railroad Commission of the State of California, confidence on our part in the Commission's qualifications to represent the people of this section at this hearing; and

Whereas, Hydro-electric development is essential to the development of all lines of business in the San Joaquin Valley and that financing is necessary to such development, and that a fair rate of return is necessary to financing. That the Commission is the only body capable of reviewing the claim of increased operating costs, due to increased prices of fuel oil, labor, materials and a shortage of water, is our opinion, and we hereby

Express our confidence in the Commission's ability to render a decision fair to the consumers, fair to the Power Corporation, and to the best interests of the community.

### Resolution Adopted by Fresno County Chamber of Commerce

Whereas, The San Joaquin Light & Power Corporation, serving the city of Fresno and the territory adjacent thereto, is applying to your honorable body for a review of its rates on January 5th; and

Whereas, The Fresno County Chamber of Commerce has been requested to appear in this case if it should so elect, therefore, be it

Resolved: That the Board of Directors of the Fresno County Chamber of Commerce hereby expresses confidence in the Railroad Commission of the State of California to properly handle this request to the best interests of this community and if the facts set forth at this investigation justify an increase in rates by the San Joaquin Light & Power Corporation, that such action would be agreeable to this body.

### NEW FACTORY FOR ELECTRICAL CONCERN

The Johnson Electric Washer Company of San Francisco has purchased property at Fortieth and Adeline Streets, Oakland, where it is planning to erect one of the most modern factories on the Coast, covering from 35,000 to 40,000 square feet. In order to achieve the greatest efficiency it will be all on one floor and lighted throughout by natural daylight.

The plant will be of combined brick and concrete construction and will employ about 200 skilled operatives. The investment is estimated at around \$100,000. The company hopes to begin operations in ninety days. The Santa Fe railroad is to run a spur track to the plant.

Officers of the company are C. P. Johnson, president and general manager, and Jules H. Kraus, vice-president and treasurer.

### OIL SUPPLY IN CALIFORNIA

The dependence of the industries of the Pacific Slope upon California petroleum lends importance to a survey of the conditions affecting the oil business.

The total oil production in California during the year 1919 amounted to about 100,000,000 barrels, according to preliminary estimates by the California State Mining Bureau. The final figure will probably show that the year's output was slightly more than that of the year 1918. The total value of crude oil at the wells was about \$133,000,000, which is some five or six millions greater than the total value of the preceding year.

The field price of crude California oil has advanced during the last six years in almost exact accordance with the price of farm products, with the exception that in 1914 and 1915 oil was relatively cheaper. Farm products, during those two years advanced slightly, while oil suffered a marked decline.

The increase or decrease of the amount of oil in storage has for several years been generally considered as an index for field prices. During the past year and a half, however, the effect of stored oil on field prices has been entirely obliterated or neutralized by the general condition of advancing prices of all commodities.

The acreage of proved oil land was materially increased during the year 1919 by developments in the Elk Hills, in Kern County, and in the Richfield field, in Orange County. The total proved oil land is now probably more than 91,000 acres, as compared with 89,212 acres in March, 1919.



Construction of additional hydro-electric power plants is reported as going forward to such an extent that the present annual consumption of oil, for generating electricity, will be reduced by about 2,000,000 barrels. The present consumption of oil, for various industrial purposes, can be still further reduced by utilizing many well-known sources of water power.

#### LIFE INSURANCE PLAN

The General Electric Company has announced a group life insurance plan for all its employees. Under this insurance plan every employee who has been with the company one year or more, will have a substantial amount of life insurance without cost to himself. This applies to everyone in the employ of the company, regardless of age, sex or physical condition.

This insurance plan will in a measure relieve the minds of employees as to the danger of financial distress in the family, in case of death. Officials of the company have long recognized the value of continuous service and it is hoped that the plan will encourage permanency of employment.

The amount of this insurance is \$500 for one year's service, \$750 for two years' service, \$1,000 for three years' service, \$1,250 for four years' service and \$1,500 for five years' service.

This group life insurance plan applies to all the General Electric plants and district offices throughout the country.

#### NEW DISCOVERY CLAIMED

A principle which will revolutionize electrical power generation methods is claimed to have been discovered by a nineteen-year-old Seattle youth, Alfred M. Hubbard. Newspapers in Seattle and elsewhere have devoted much space to Hubbard's development. According to their accounts, his device is "in appearance a small coil of wire about six inches in diameter, surrounding a permanently magnetic core eight inches long, the entire contrivance easily carried in a man's hand." This apparatus, it is said, has no moving parts, nor does it obtain energy through chemical action.

A demonstration of the apparatus was given before a number of engineers, and it is alleged that the device caused

a 25-watt tungsten filament electric lamp to glow at dull red "as often as the experts made the necessary connections." A 60-watt lamp of the same type is said to have glowed to about the same degree.

Most electrical engineers, while expressing doubt, are withholding final opinion until they have more definite data.

#### BUSINESS AND THE UNIVERSITY EXTENSION

"Business First" is the slogan of the Extension Division of the University of California, and the first classes offered in San Francisco are to be in business subjects, Advertising and Salesmanship. New Spanish courses are also to be offered, which have been specially designed to equip the ambitious young business man and woman for entering foreign trade activities. A class in the correction of speech defects is scheduled to begin the first week in January; there are also classes in first aid and domestic hygiene.

The new announcement of courses for University Extension class work in San Francisco has just been issued from the San Francisco office of University Extension, 140 Kearny Street, and from Room 301, California Hall, Berkeley, at which places full information can be obtained regarding the 150 courses about to commence in San Francisco.

#### TRADE NOTES

##### Underwriters' Approval —

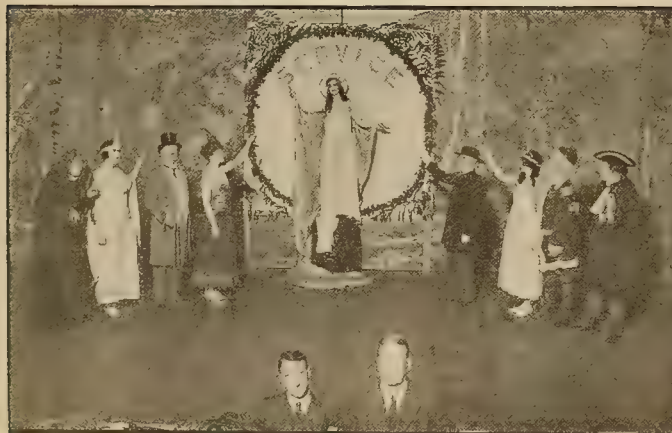
Electrical File No. E 4164 of the Underwriters' Laboratories of the National Board of Fire Underwriters, dated December 1, 1919, approves "Union" Renewable Fuses of all amperes from 0 to 600, 250 volt. These fuses are manufactured by the Chicago Fuse Manufacturing Company, who have specialized in the manufacture of fuses for more than thirty years.

##### Plant Extension —

Fairbanks, Morse Company have sold the city of Condon, Oregon, 1-100 hp. Diesel oil engine to use for air extension of their electric light plant.

##### Change of Offices —

A. H. Lamm, consulting engineer, and Earl Cash, architect, have moved to 314 Lewis Building, Portland, Oregon.



Principals in the musical sketch "A Love o' Lights," produced by the Pacific Service Employees' Association at Scottish Rite Hall, Tuesday evening, December 23rd. From left to right these are: Chief Gloom, Harry Fossey; Second Spirit of Light, Miss Zita O'Connor; Monoxide Gas, Esquire, Clarence H. Oliver; Miss Electra, Mrs. Eileen Piggott; Spirit of Service, Miss Jeanette Doub; Reverend Jay A. Bee, John A. Britton; First Spirit of Light, Miss Louise Jorgensen; Spirit of Christmas, R. A. Gentis; Town Crier, A. U. Brandt. In the foreground are seen, respectively, Lowell Redfield, composer of the music, and Frederick S. Myrtle, by whom the book and lyrics were written.

Closing ensemble and tableau in the musical sketch "A Love o' Lights," produced by the Pacific Service Employees' Association on the evening of Tuesday, December 23rd, at Scottish Rite Hall, showing the principal characters, Monoxide Gas and Miss Electra, the Matrimonial Parson, the Spirit of Service to whom all pay homage, and chorus of Spirits of Light, Glooms, Retinue of Monoxide Gas, Dancing Power Houses. At the extreme left stand, respectively, Mr. Frederick S. Myrtle, composer of the book and lyrics, and Mr. Frank L. Mathieu, under whose personal direction the production was staged. At the right are seen, respectively, Mr. R. Earle Fisher, president of the Pacific Service Employees' Association, and Mr. Lowell Redfield, who wrote the music for the sketch.



**New Installations —**

The Spokane, Portland and Seattle Railroad Company have purchased from Fairbanks, Morse Company 1—25-hp. Diesel engine for a water pumping plant along the right of way. They expect to substitute Diesel engines for gasoline engines where it is possible.

**Branch Office —**

The Richardson-Phoenix Company, lubrication engineers and manufacturers of Milwaukee, Wisconsin, announce the opening of an office at Birmingham under the management of James D. Scruggs. The office is located at 306 American Trust Building.

**Salesmanagers' Conference —**

A conference of Monitor Controller Company branch office salesmanagers was held in Baltimore on the 29th, 30th and 31st of December. Many important announcements were made with reference to the manufacturing, sales and advertising policies of the company for the coming year.

**Manager Appointed —**

The Roller-Smith Company, 233 Broadway, New York City, makers of electrical instruments, meters and circuit breakers, announce the appointment of G. Lindstrom as works manager of its plant at Bethlehem, Pa. Mr. Lindstrom is a graduate of the Royal Institute of Technology at Stockholm, Sweden, having secured his degree of M. E. in 1906 and the degree of E. E. in 1907.

**Notice of Removal —**

The St. Louis sales office of the Standard Underground Cable Company, E. J. Pietzcker, manager, will on February 1st be removed from the Security Building, where it has been located since 1897, to the Arcade Building.

**EXAMINATION FOR REGISTERED ENGINEERS**

The State Board of Engineering Examiners of Oregon held its first examination on Dec. 5, 1919. Applicants in civil, mechanical, and electrical engineering were examined, in written and oral tests.

The written examination consisted of two parts: Part one—Questions in mathematics, which all applicants were required to answer without books. Part two—Questions in the particular branch in which the applicant desired to register; any books the applicant desired could be used. The oral examination consisted of questions propounded by the members of the board to the candidates, examined individually.

The papers were as follows:

**QUESTIONS ON MATHEMATICS**

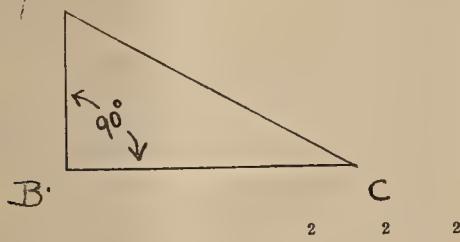
For all applicants. Answer all questions. Show your computations.

(1) A number consists of two digits, the sum of the two digits being 10. If the digits be reversed, the new number is 18 larger than the original number. What is the number?

(2) A top of a tower (T) is in view from two points A and B. The horizontal distance between A and B is 340 feet. The horizontal angle between T and A measured at B is  $36^{\circ}12'$  and the horizontal angle between T and B measured at A is  $28^{\circ}$ . The vertical angle to the top of the tower measured at A is  $47^{\circ}$ . What is the height of T above A in feet?

(3) If there are 66  $\frac{2}{3}$  pounds in a cubic foot of sea water, 2000 pounds in a ton, one gramme of gold in a ton of sea water, (1000 grammes = 1 Kilogram = 2.205 pounds) and 300,000,000 cubic miles of water in the ocean; how many tons of gold in the ocean?

(4)



Prove by geometric demonstration that  $AC = AB + BC$

(5) Two spherical balls, one 12 inches in diameter weighing 10 lbs., the other 3 inches in diameter, weighing 6 lbs., are dropped from a height of 200 feet. How long will it take each to reach the ground, neglecting air resistance?

**QUESTIONS FOR ELECTRICAL ENGINEERS**

Answer all questions.

(1) A city on the North Pacific Slope proposes to develop and transmit power from a stream having a minimum flow of 500 second feet of water with an available effective head of 200 feet.

The distance from the proposed power station to the proposed central distributing sub-station is 50 miles, about half of which is through heavily wooded right of way and the balance along public highways.

The electricity is to be used for both light and power with a ratio of maximum to average demand of 3:1. It is desired to develop the power plant to the full minimum flow with sufficient reserve capacity to be reasonably sure of maintaining continuous operation. Power is to be transmitted to the city as economically as possible, assuming interest on the investment at 6% and the value of power at \$40.00 per kw. per year.

The distributing voltage is to be 2300 volt, 3 phase, 60 cycle.

(a) Give number and size of units you would install at the generating plant with voltage, phase and cycles.

(b) Give number and size of step up transformers you would install.

(c) Give transmission voltage, phases and size of wire.

(d) Would you use wood poles or towers in transmission line—why?

(e) What transmission losses would you allow?

(f) Give number and size of step down transformers.

(2) It is proposed to develop power with a steam engine to supply the following:

One—20-hp. 220V, D.C. Motor-Load varies from 10 to 20 hp.

One—10-hp. 220V, D.C. Motor-Load varies from 7 to 10 hp.

One—5-hp. 220V, D.C. Motor-Load constant 5 hp.

Motors are located 1000 feet from the generating plant.

(a) What size engine and generator would you install—Why?

(b) What size wire would you use for transmission?

(c) What would be the power loss and drop in volts?

(3) (a) Explain and show by diagram the difference between a three wire single phase 110-220 volt system and a three wire 110-220 volt Edison direct current system.

(b) What is the relation of the current in the common return wire in a two phase 3 wire system, in relation to the current in the outside wires—also show by diagram.

(4) State the principal factors which limit the capacity of an existing transmission line and which must be considered if it is desired to increase its capacity.

(5) (a) What is the size of wire in circular mills which should be used for a 2-wire direct current circuit under the following conditions, allowable drop to the farthest lamp is 2 volt, load consisting of twenty incandescent lamps, each taking  $\frac{1}{2}$  an ampere, distance from starting point of circuit to load center is 90 feet.

(b) In the following problem neglect line reaction: Given a load of 20 kw., voltage of circuit 220. Power factor, 185, distance is 180 feet, allowable drop 4 volts. What size of wire should be used expressed in cir. mils.?

**QUESTIONS FOR MECHANICAL ENGINEERS**

Select and answer five of the following:

1. What horsepower motor should be installed for a passenger elevator service which will have an unbalanced load of 3000 pounds and speed of travel of 250 feet per minute, if driving efficiency is 90 per cent, motor efficiency 85 per cent, and worm gear efficiency 60 per cent?

2. In order to control an engine against variations in external work, it is necessary to call upon the flywheel for 80,000 ft.-lb., with an allowable change in speed from 170 to 150 r.p.m. Assuming that the diameter of the wheel is 20 feet, compute its weight.

3. A leather belt treated with dressing has cc efficiency of friction on an iron pulley of 0.3. The belt encircles  $200^{\circ}$  of a pulley 10 feet in diameter. When running at 140 r.p.m. the belt must transmit 300 horsepower. How wide should belt be if it is designed to stand 100 pounds per inch of width?

4. A boiler evaporates 10 lbs. of water per pound of coal from and at  $212^{\circ}$ . Coal contains 13,000 B.t.u. per pound. What is the combined efficiency of the boiler and grate?

5. A street car plant uses ten cars each requiring an average horsepower of 75. Efficiency of car is 60 per cent; of transmission, 75 per cent; of substations, 75 per cent; and of main engines and dynamo, 75 per cent. M.E.P. of engine, 40 lbs.; r.p.m., 150. Plant has two engines. What would be their size? Assume 600 ft. per minute piston speed.

6. Describe two prevalent types of reverse motions in Reciprocating Engines and state briefly their relative advantages and disadvantages.

7. A cast iron beam is to be used for carrying a quiescent load of n pounds. The foundry has two sections available, one hollow rectangular of a depth equal to twice the width, which sells for 6c per lb.; the other of I beam shape with top and bottom flanges each of a width equal to one-half of the total depth, selling for 5c per lb. The thicknesses in both sections are equal to  $\frac{1}{12}$  of the overall depth and uniform throughout. Which is the most economical section? Give calculation in detail, disregarding shear and bearing stresses.

8. Make a rough sketch showing principal dimensions of a connecting rod for a horizontal single cylinder engine  $12'' \times 28''$  working under an initial steam pressure of 150 lbs. per square inch with a  $\frac{1}{2}\%$  cut-off and at a piston speed of 600 ft. per min.

9. Calculate the tensile stress in a band  $2'' \times 1''$  shrunk around a hub  $20''$  diameter with a shrink fit  $\frac{1}{48}''$  in diameter smaller than hub.

10. (a) Make a rough sketch showing principal dimensions of a cast iron split pulley 60-in. diameter, 18 in. face,  $3 \frac{15}{16}$  in. bore and key seated.

(b) Name the maximum rotative speed at which above pulley may be run.



## LATEST IN EVERYTHING ELECTRICAL

(An electrically-heated compound melting pot which will be of especial convenience in electrical repair work, is among recently introduced industrial devices. A special flexible power system which has proven very successful in operation is also described here.—The Editor.)

### AN ELECTRIC COMPOUND MELTING POT

The General Electric Company has recently developed an electrically heated compound melting pot, for melting battery compound and other compositions of like nature, which should interest garage and repair shop owners, as well as all others whose business includes the manufacturing and repair of electric batteries.

To such men, the inconveniences and risks of the gas flame method of melting compounds are the cause of considerable annoyance, due to the loss of time, waste of material, and the increased fire risk.

The gas flame is a method of heating, practically impossible to regulate with any degree of flexibility. It fails to give an even distribution of heat, and is unreliable. This, together with the haphazard sort of containers generally in use, necessitates the constant attention of the operator. If he is called away and forgets to turn down the flame, the compound owing to its inflammable nature will soon catch fire, resulting oftentimes in considerable financial loss. Or, if the flame is turned down enough for safety, the compound will probably cool so as to necessitate its being re-melted, hence, waste of time.

How the General Electric compound pot by its efficiency, reliability and safety, eliminates these dangers and waste, is best explained by a brief description of the pot itself. The compound pot is made in four-quart size, and is solidly built with a bail to facilitate handling. It is provided with flange around the top, so that if it is desired, it can be lowered into a hole to bring the top flush with the table. This flange extends over the inside so that the compound cannot boil over the edge, this often being the case when old compound is desired to be re-melted, inasmuch as old compound is often impregnated with acids. The inner flange also acts as a lip for scraping the compound from the ladle, thus preventing waste.

The heat is provided by a 3-heat unit of the well known cartridge type, which is inserted in a slot at the bottom of the pot. This unit is regulated by a three-point plug switch for obtaining three heats. The unit is reliable and does not require any attention of the operator. Many of these units are in use daily and are operating with entire satisfaction.

Thus, a uniform, well distributed heat is assured, and the danger of fire from over-heating and of cooling from insufficient heat during the operator's absence is eliminated. If the operator is called away he may leave the pot without any fear of its contents catching fire, and while the heat is sufficient to keep the compound in a molten state, it is not enough to cause combustion.

The pot is as nearly fool-proof as such a device can be. It is clean, portable, economical, durable and eminently safe.

### A FLEXIBLE POWER SYSTEM

A very flexible system of power generation and distribution has been developed by the John Lang Paper Company of Philadelphia. There are four independent manufacturing units in the mill, each complete in itself from rag cutter to paper machine. Each paper or board machine is electrically driven and normally each is supplied with power from its own alternating current generator. All the generators and paper-machine motor circuits are, however, controlled from a single switchboard, so that it is possible in case of trouble to operate any given paper machine with power from any of

the generators, so that the chances of a complete shut-down are very remote. The generators range in size from 200 to 450 kva.

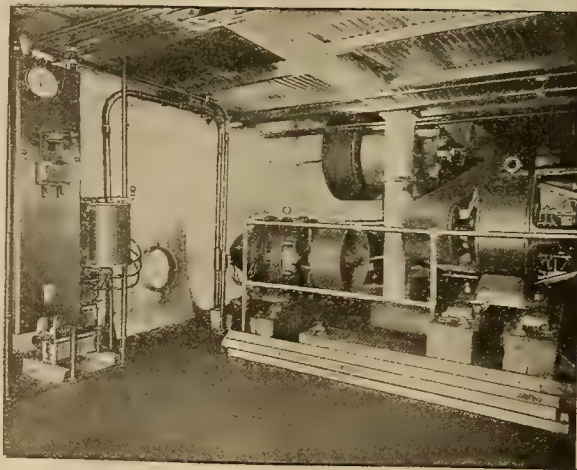
Another interesting feature of the power arrangement is the use of a fifth generator of 300 kva. which is controlled from a separate section of the switchboard, and is intended to be used on Sundays and holidays only. If desired, all of the rest of the switchboard panels can be "deadened" for inspection, repairs, etc., while the small generator operates the lights and provides enough power to make repairs.

Three of the paper machines are driven by constant-speed alternating-current motors of from 75 to 100 hp., speed control of the variable speed end being obtained by means of mechanical speed changing devices.

The fourth machine, however, is provided with the complete Westinghouse system of paper machine drive. In this system, the power is divided into two parts. The screens and pumps of the wet end are driven by constant-speed alternating current motors, but the dryers and other parts of the variable speed end are operated by a 75 hp. direct-current motor, which received its current from a 60 kw. synchronous motor generator set.

The motor has a speed range of 5 to 1. A two-step cone pulley is also used so that a range of paper speed from 25 to 125 feet per minute can be obtained on one cone, and from 40 to 200 feet per minute on the other. This 5 to 1 speed range motor is somewhat less expensive than one from which the entire 8 to 1 speed range could be obtained electrically, and since the class of stock made on the machine is not changed frequently, the inconvenience involved in changing from one step to the other on the lone pulley is negligible.

The motor is controlled by means of conveniently located push buttons adjacent to the paper machine and the motor. The motor is started by pressing a button marked "start," and it accelerates to a panel corresponding to the previous position of the combination field rheostat. The speed can be increased further by pressing a button marked "fast." An indicator shows the paper the speed, the pressing a button marked "stop," stops the machine. The actual electrical connections necessary to control the motor are made by magnetic switches and a motor operated field rheostat.



Westinghouse 75 hp. wound rotor induction motor driving constant speed line shaft at left, and 75 hp. 275-1150 r.p.m. d.c. motor driving variable speed end of paper machine on right.



## Books and Bulletins

### Cutler-Hammer Publications

Electrical Operation of Gate Valves, is the title of a new booklet, being distributed by The Cutler-Hammer Mfg. Co. of Milwaukee and New York, which contains a reprint of an address given by Peter Payne Dean before the Metropolitan Section of The American Society of Mechanical Engineers. Several illustrations and drawings have been added to aid the description of the Dean system of electrical control of gate valves.

Primarily, the Dean Control System consists of a totally enclosed water-proof driving motor, reduction gears and limit trip mechanism combined into a single unit for the operation of the valve gate. The control of the valves is secured by means of one or more remote control stations. The booklet makes mention of the desirability of having remotely controlled valves in power stations, waterworks, drydocks, refrigerating plants and oil refineries. It describes some of the standard valves and explains how these may be equipped for power operation with remote control without removing the valve and putting it out of service.

C-H Space Heaters are illustrated and described in a new 4-page two-color  $8\frac{1}{2} \times 11$ " pamphlet No. 479, entitled "Miscellaneous Applications of Electrical Heat." The pamphlet emphasizes numerous applications of electrical heat by means of flat standardized heaters, two feet long,  $\frac{3}{16}$ " thick and  $1\frac{1}{2}$ " wide. The entire heater is built to withstand hard service and vibration. All parts are enclosed and cannot jar loose. There is no porcelain, cement, asbestos or moulded insulation material used, the resistance being encased in sheet mica which in turn is encased in a steel jacket. After sealing, the heater is placed in an hydraulic press and 25 tons pressure applied. Ten of them, constituting a standard package, are packed in a box which affords a handy means of storing and identifying them.

Methods of mounting, methods of connecting, dimensions, wattages, weight, code numbers and prices are included in the pamphlet. Space is provided for dealers' imprint, as a large number of jobbers and supply houses now carry the space heaters in stock.

### Lighting

An excellent series of bulletins on various types of lamps and lighting has been issued by the engineering department of the National Lamp Works of the General Electric Company. These include "Show-Window Lighting," "Fundamentals of Illumination Design," "Miniature Mazda Lamps," "Street Series Mazda Lamps," "Multiple Mazda Lamps," "Industrial Lighting" by Ward Harrison and N. N. Magdsick, "Mazda Lamps for Projection Purposes," "The Mazda Lamp in Photography," "Store Lighting," "Reducing Operating Costs," "A Mazda Lamp for Motion Picture Projection," "Country Home Lighting," "The Lighting of Offices and Drafting Rooms," "Lighting Comment." Each is illustrated with photographs, charts and diagrams, and supplies useful and inclusive information on the subject under consideration.

These bulletins will be supplied to anyone interested upon request.

### University Publications

A bulletin from the College of Agriculture of the University of California, written by Professor F. W. Woll, deals with the success of the milking machine as a practical and safe labor-saving device, as brought out in a series of experiments conducted at the University of California.

"Commercial Fertilizers" is the title of Bulletin No. 315, by P. L. Hibbard, issued by the Agricultural Experiment Station, University of California.

The University of Illinois Engineering Experiment Station issues in bulletin form "A Study of the Forms in Which Sulphur Occurs in Coal," by A. R. Powell, with S. W. Parr.

### Bureau of Mines

A recent publication by the Bureau of Mines is "Approximate Quantitative Microscopy of Pulverized Ores," Technical Paper 211, by W. H. Coghill and J. P. Bonardi.

Bulletin 181, issued by the bureau is "Abstracts of Current Decisions on Mines and Mining," by J. W. Thompson.

The bureau issues the following summary of its publications for November, 1919:

Technical Paper 226, "Men Who Received Bureau of Mines Certificates of Mine Rescue Training, July 1, 1916, to June 30, 1918," compiled by D. J. Parker, 1919; 72 pages.

Technical Paper 231, "Production of Explosives in the United States During the Calendar Year 1918, with Notes on Coal-Mine Accidents Due to Explosives and List of Permissible Explosives Tested Prior to March 31, 1919," compiled by A. H. Fay, 1919; 21 pages.

Technical Paper 234, "Sensitiveness of Explosives to Frictional Impact," by S. P. Howell, 1919; 17 pages, 2 plates, 9 figures.

Technical Paper 236, "Abatement of Corrosion in Central Heating Systems," by F. N. Speller, 1919; 12 pages, 2 figures.

Technical Paper 239, "Coke-Oven Accidents in the United States During the Calendar Year 1918," compiled by A. H. Fay, 1919; 26 pages.

Technical Paper 242, "Why and How Coke Should Be Used for Domestic Heating," by Henry Kreisinger and A. C. Fieldner, 1919; 20 pages, 1 figure.

Miners' Circular 22, "Dangerous and Safe Practices in Bituminous Coal Mines," by Edward Steidle, 1919; 80 pages, 181 figures.

Only a limited supply of these publications is available for free distribution, and applicants are asked to cooperate in insuring an equitable distribution by selecting publications that are of especial interest. Request for all papers cannot be granted. Publications should be ordered by number and title. Applications should be addressed to the Director of the Bureau of Mines, Washington, D. C.

### Bureau of Standards

A new Scientific Paper published by the Bureau of Standards is "Airplane Antenna Constants" by J. M. Cork, Assistant Physicist of the Bureau of Standards. Methods for measuring the capacity, inductance, resistance, and natural wave length and also the directional transmitting effect of airplane antennas, with the plane in flight, are described. Using these methods, results obtained upon various forms of fixed antennas as well as one, two and four trailing wires, are recorded.

Circular No. 81 of the Bureau of Standards is "Bibliography of Scientific Literature Relating to Helium," covering the scientific literature relating to helium published up to January 1, 1919.

The Bureau of Standards has also prepared a series of reports on radio subjects, including the following:

- Electron Tube Generators.
- Electron Tubes as Receivers.
- Properties of Electron Tubes.
- Aerials and Direction Finders.
- Insulating Materials at Radio Frequencies.
- Production and Measurement of High Voltage and Large Current at Radio Frequencies.
- Radio Measurements.
- Testing of Radio Apparatus.
- Cathode-Ray Oscillograph.
- Suggestions for Radio Research.
- Transmission Phenomena.
- Bibliographies.
- Submarine Radio.
- Airplane Signalling.

Experimental-Retort Tests of Orient Coal by R. S. McBride, Engineer Chemist, and I. V. Brumbaugh, Assistant Gas Engineer, is published by the Bureau of Standards as Technologic Paper No. 134.

### Transformer Installations

An interesting booklet is issued by the Pittsburgh Transformer Company, of Pittsburgh, Pa., describing a number of successfully operated installations of Pittsburgh Transformers. The pages consist almost entirely of photographs, which are of high quality and tell their story very effectively.



## NEW ELECTRICAL DEVELOPMENT

(The Northwest outlines extensive electrical developments in many branches for the coming year; numerous new manufacturing plants are featured in the Pacific Central news, while extensive power and irrigation projects are under way both in the Southwest and Inter-mountain Districts.—The Editor.)

### THE PACIFIC NORTHWEST

**PETERSBURG, ALASKA.**—Bonds in the sum of \$75,000 for a municipal lighting plant and a new schoolhouse carried in a recent election.

**SEATTLE, WASH.**—The Standard Electric Company has been incorporated for \$25,000 by Herbert C. Moss, P. Martin and Frances Moss.

**ROSEBURG, ORE.**—Mayor Hamilton has filed a report of the water power sites available for a municipal lighting and water system. Three sites are available capable of producing 21,000 horsepower of electrical energy.

**TACOMA, WASH.**—Joint management of street car lines in Tacoma is proposed by Mayor Riddell. While the plan is being discussed the ten-cent fare rate will be held in abeyance, it was agreed. The city proposes to run the lines of the street car company in cooperation with its own.

**SEATTLE, WASH.**—Thompson & Castleton, Inc., electrical engineers and contractors, 316 First Avenue, South, Seattle, recently installed a 3000-kilowatt outdoor substation for the Northwest Power & Manufacturing Company at Port Gamble, Washington, for transmitting power across Hoods Canal to supply the city of Bremerton, Washington.

**SALEM, ORE.**—The city of Scio, through its mayor, has filed application with the State Engineer here for the appropriation of 40 second feet of water from Thomas creek for the development of 326 horsepower for municipal purposes. The cost of the proposed improvement is estimated at \$38,427 and includes the construction of a flume, canal and other works.

**SEATTLE, WASH.**—Early decision as to the location of an intermediate service reservoir to be constructed as part of an extension of the city's water system recently authorized by the city council was urged by City Engineer A. H. Dimock in a communication discussing the relative value of different sites filed with the city council.

**TACOMA, WASH.**—Bids will be received up to January 17 at 2 p. m. by the commissioner of light and water for 20,000 pounds of chlorine gas to be delivered f. o. b. cars Green River headworks. Plans and specifications on file in the office of the commissioner of light and water. Bid must be accompanied by certified check for five per cent of the amount bid.

**ROSEBURG, ORE.**—Application for permit to appropriate 1000 second feet of water from the North Umpqua River for the development of 3000 horsepower at Whistler's Bend has been filed in the office of Percy A. Cupper, State Engineer, by this city. Development calls for construction of a concrete diversion dam 800 feet long across the river, a tunnel 8 x 20 feet in size, 700 feet long, and other works at an estimated cost of \$500,000, power to be used by this place.

**SEATTLE, WASH.**—F. W. Rust & Company, Inc., electrical contractors and engineers, Seattle National Bank Building, Seattle, have just finished complete electrical wiring in the Wells Building at the corner of Third Avenue and Pine Street and are starting like installation in the Peoples Store Building, a seven-story structure at Pine Street and Minor Avenue. Another job recently completed by this concern was the terminal post office building at the King Street railway station.

**CENTRALIA, WASH.**—Mayor T. C. Rogers and Glen Norman, superintendent of the city light department, have returned from Clarkston,

Washington, having inspected there a power plant owned by the Washington-Idaho Light & Power Company which the Sherman County Light & Power Company proposes to install here. Equipment is reported in first-class condition. Sherman County Light & Power Company was recently awarded a contract to begin furnishing electricity to the city October 1, 1920.

**SEATTLE, WASH.**—Preliminary to final action of the city council of Seattle on the proposition, Councilman William Hickman Moore was authorized by the council utilities committee at a recent meeting to make an appraisal of the property of the Seattle & Rainier Valley Railway Company and to conduct negotiations with officers of the company looking to the purchase of the property by the city. The railway company, in response to an invitation from the city council several days ago, submitted a proposition in which it was agreed to sell for \$1,656,766.

**SPOKANE, WASH.**—The Inland Empire Railroad System, Spokane, is to spend \$60,000 this year for the conversion of the present two-men street cars on the traction lines to the one-man type, according to Receiver F. E. Connors. According to Receiver Connors a new company will be incorporated to take over the property of the Inland after the receiver's sale is confirmed by the court and the road turned over to its new owners. The Inland as it stands represents an investment of between \$5,000,000 and \$6,000,000 to its new owners, according to the receiver.

**BREMERTON, WASH.**—Okeh Irrigation District, Brewster, Washington, has placed an order with the Seattle office of the Allis-Chalmers Manufacturing Company for an irrigation pumping plant which will be installed on the Columbia River early in the summer of this year to consist of one eight-inch Type S centrifugal pump of the horizontal split case type, direct connected to one 175 horsepower slip-ring induction motor which will be wound for 2200 volts service, also one five-inch pump of similar design direct-connected to a 40 horsepower slip-ring motor. The transmission line will be constructed by the Okanogan Valley Power Company which will supply current for this installation.

**SEATTLE, WASH.**—With a number of additions to the city light and power system contemplated during the year 1920, Superintendent J. D. Ross of the Lighting Department, has submitted to the council of Seattle his estimate of the cost of the year's program, placing the amount necessary to carry out this year's program at \$1,750,000. This sum is exclusive of the funds already provided by the council for the Lake Union steam plant which is now under consideration and for the generating power plant at Cedar Falls, for which a total amount of \$330,000 has been appropriated. It includes, however, \$677,803.52 which will be required to complete installation of a pipe line from the impounding dam at Cedar River to the proposed power unit at Cedar Falls. Superintendent Ross informs the council that the following construction work is included in the 1920 program of extensions in the lighting system: sub-station at Spokane street and East Marginal Way, \$225,000; connection from Cedar River transmission lines to this station, \$30,000; connection from same station to distributing station, \$30,000; connection from new station to West Seattle lines, \$80,000; transformers,

\$50,000; additions to existing sub-stations, \$150,000; new feeders, \$40,000; extension to distributing network, \$280,000; additions to street lighting system, \$30,000; concrete housing store-room and shops, \$250,000.

### THE PACIFIC CENTRAL DISTRICT

**MERCED, CAL.**—An election was held in Merced on January 2nd to vote on the organization of the Madera Irrigation District.

**SAN FRANCISCO, CAL.**—The Board of Public Works awarded the United States Steel Products Company the contract for furnishing and delivering track special work in accordance with contract No. 122, Municipal Railway System.

**FRESNO, CAL.**—Sewer bonds for the north Fresno districts are now being printed. The total bond issue was \$200,000 of which the first contract was \$118,000. This provides for the construction of the main sewer lines, and from the sale of the remainder of the bonds the laterals will be constructed.

**RICHMOND, CAL.**—Agents for the Pacific Gas & Electric Company are taking signatures among residents of the Pullman section for the introduction of gas service into that district. The service of gas to Pullman residents will be possible from the new main recently laid by the gas company along Cutting boulevards.

**YREKA, CAL.**—Voting 20 to 7, the Scott Valley Irrigation District ratified a proposed bond issue in the amount of \$125,000. The proceeds from the sale of the bonds are to be used in the construction of a ditch along the foothills on the East Side of Scott Valley, distributing water to approximately 6,000 acres of fertile land.

**SAN FRANCISCO, CAL.**—New York engineers and surveyors have prepared plans for one of the biggest irrigation dams in the West, which will bring water to thousands of acres of land in El Dorado and Amador Counties. The scheme aims to utilize the water of the Consumnes River. The project calls for an investment of \$20,000,000 to build a dam large enough to store 200,000,000 gallons of water a day.

**YUBA CITY, CAL.**—If the rice industry of a vast acreage of lands in Butte, Sutter, Glenn and Colusa counties is to be saved the owners must at once organize a reclamation district covering more than 176,000 acres, it was declared by attorneys here who base their prediction on the opinion that the Colusa County Superior Court will sustain a petition for a permanent injunction of the Moulton Irrigating Lands Company to turn irrigation water into Butte Creek.

**STOCKTON, CAL.**—A new manufacturing plant being built in Stockton is the Campo Tractor Company, having a capitalization of \$1,000,000. Bank clearings for the month of November were the largest on record, showing a total of \$27,063,500, and it is believed that December will be even greater. The clearings for the week ended December 4 totaled \$7,013,200, the second largest during the year, and an increase of \$4,911,565 over the corresponding week last year which showed \$2,101,635.

**SACRAMENTO, CAL.**—Application has been filed with the State Water Commission by Luther Hill, Independence, to appropriate 11.25 cubic feet per second from Sawmill Creek, Inyo County, tributary to Owens River, for generating electric power. The total amount of power



to be developed is 424 t.h.p. Diversion works consist of a pipe line five miles long and a concrete dam six feet high, twelve feet long on top and six feet long at bottom.

**WOODLAND, CAL.**—The City Trustees have made public an ordinance establishing an underground district in the city of Woodland. It provides for a conduit system for all electric lines. The ordinance requires that the work shall be completed before January 1, 1921. It is estimated that the cost of constructing a conduit system will cost between \$100,000 and \$125,000. This cost, coupled with the estimated cost of removing the gas manufacturing plant, will represent an outlay of nearly half a million dollars by the Pacific Gas & Electric Company in this city.

**SACRAMENTO, CAL.**—Application has been filed with the State Water Commission by Scott McArthur, McArthur, Shasta County for permission to appropriate 200 cubic feet per second from East Fork Tule River, Shasta County, tributary of Fall River, for generation of power. The total amount of power to be developed is 1,363 t.h.p. Diversion works consist of a main canal four miles long with timber headgate with clear opening forty-two feet wide and six feet deep, controlled by horizontal flashboards supported on timber vents. Estimated cost of proposed works, \$75,000.

**RICHMOND, CAL.**—The Atomizing Metals Company, Richmond's newest industry, will start operation shortly. This concern will manufacture wool from metal for use in making certain grades of roofing paper. Power will be furnished by the Western States Gas & Electric Company, Richmond division, beginning with a 100-horsepower unit.

**SACRAMENTO, CAL.**—Application has been filed with the State Water Commission by R. G. McDonald, Mina, Nev., for 300 cubic feet per second from West Walker River, Mono County, tributary to Walker River, for generation of electric power. The amount of water to be stored is 75,000 and 20,000 acre feet. Total amount of power to be developed approximately 30,000 t.h.p. Diversion to be by means of a pipe line about ten miles long and a dam 150 and 75 feet high, 1,600 and 500 feet long on top and 200 and 200 feet long at bottom, with either multiple arches of earth fill gravity type. Two reservoirs are contemplated, one at Pickle Meadows and one at highway bridge to store water from east branch. The estimated cost of the proposed works is \$4,500,000.

**MARYSVILLE, CAL.**—Cordua Irrigation District, Ellis Block, Marysville, has been receiving bids for the following work: A main irrigation canal approximately six miles in length requiring approximately 35,000 cubic yards of excavation and 10,000 cubic yards of embankment, together with the installation of necessary drainage culvert. One semi-circular metal flume, approximately 3,100 feet long and approximately 76.4 inches in diameter, supported on a wooden substructure on concrete footings with reinforced concrete inlets and outlets for the same. One semi-circular metal flume, approximately 1,050 feet in length and approximately 76.4 inches in diameter, supported on a wooden substructure on concrete footings with reinforced concrete inlets and outlets for the same.

**UKIAH, CAL.**—The Gravelly Valley dam has ceased to be a conjecture and has assumed the status of a reality. Branded as an intangible dream fifteen years ago, it became an assured fact when the Snow Mountain Water & Power Company negotiated a contract with a well-known firm of contractors of San Francisco, calling for the construction of a dam at Gravelly Valley by December 1, 1920, with a clause allowing sixty days additional time in case of unforeseen trouble. The cost of construction of this stupendous project aggregates over \$1,000,000 and does not include the clearing of Gravelly Valley, which must be accomplished before the water is allowed to back up behind the dam. The contract specifies a dam 100 feet high, 650

feet long at the top, approximately 109 feet wide at the base, depending on the depth at which bed rock is found, and tapering to ten feet in width at the top. Such a dam, located as it will be, at a point where the Eel rushes into a deep canyon, between Pine Mountain on the south, and a spur of San Hedrin, on the north, will form a reservoir which will cover practically all of Gravelly Valley and will maintain a steady head of 250 second feet of water throughout the year. Between 85,000 and 100,000 barrels of cement will be used, and the dam will contain approximately 85,000 cubic yards laterals will be constructed.

## THE PACIFIC SOUTHWEST

**TOMBSTONE, ARIZ.**—C. B. Perry contemplates the erection of a dam ten miles southeast of Hurricane, Utah, four miles south of Arizona state border; 6,000 acres of ground are to be irrigated.

**PALMDALE, CAL.**—Palmdale and Little Rock Creek Irrigation District will vote on \$582,000 bond issue in the new year. The money is to be used for joint construction by both districts of a large dam in Little Rock Creek Canyon, also improvement of the Harold Reservoir at Palmdale.

**SAN BERNARDINO, CAL.**—A project to construct a hydroelectric power plant in Falls Creek, tributary to Mill Creek, to cost \$125,000 has been started by Ralph J. Chandler, of Los Angeles. Power to be developed is 1,500 hp. Diversion works will consist of a pipe line three-quarters of a mile long, a concrete dam ten feet high and forty feet long with wasteway over dam.

**PHOENIX, ARIZ.**—W. S. Norviel, State Water Commissioner has granted permission for the construction of an irrigation project about one mile below the diversion dam of the Buckeye Canal. A brush wing dam will be built for purpose of diverting enough water to irrigate 400 acres of land. Water to be supplied to lands by new canal which is to be about four miles long and known as the Gurwoll Ditch.

**MENTONE, CAL.**—Material for water projects in the Yucaipa Valley is beginning to arrive. Three water companies in the valley are planning to spend about \$250,000 on improvements and extensions. The South Mesa Water Company is planning to complete the water system at a cost of \$30,000 to \$50,000. Water Company No. 1 is to spend \$50,000 extending pipe lines and sinking wells, Captain S. Hasbrouck to be in charge. The Dunlap Ranch Water Company will spend about \$150,000 in sinking wells, building pipe lines and reservoirs.

**LOS ANGELES, CAL.**—William Wrigley announces that Wilmington will soon succeed San Pedro as the Los Angeles Harbor terminus of steamers of the Wilmington Transportation Company, plying between Santa Catalina Island and the main land. Preliminary arrangements have been effected and application has been made to the State Harbor Commission for permission to use 1,000 feet of the Wilmington Municipal Wharf. Also the Pacific Electric Ry. will run special trains for accommodation of passengers and freight from Los Angeles direct to docks in Wilmington.

**TULARE, CAL.**—Officials of the San Joaquin Valley Water Conservation and Development Association have prepared for submission to State and Federal authorities a plan for a complete survey of the water resources of the district from the Tehachapi to Stockton, as a preliminary to adoption of a plan for an irrigation system which will cover the valley in its entirety. This survey, if made along the suggested lines, would be a compilation of data on the annual run off, as well as the probable available water from underground flow, and would include maps of the various watersheds.

**BRAWLEY, CAL.**—It was brought to the attention of the electrical contractors of the valley at the last meeting of their organization at the

Barbara Worth Hotel in El Centro, that more cooperation between the cities was necessary in the provision of efficiency and qualifying inspectors, as the compensation insurance companies will not hold themselves responsible for possible accidents under the present method of inspection. When the inspectors are not able to pass the underwriters' examination to test efficiency, the property owners lose a reduction in insurance which they might gain if the city was inspected by competent electricians.

## THE INTER-MOUNTAIN DISTRICT

**LEVAN, UTAH.**—This city is negotiating with the Fountain Green Light & Power Company for the extension of its electric service to the town of Levan.

**PARIS, IDAHO.**—This city is planning to enter the elite class of well-lighted communities by the installation of a first-class "White Way" system of street lighting on the principal business streets.

**MILLVILLE, UTAH.**—At a recent election, this city voted to lease its electric distribution system to the Utah Power & Light Company, allowing the company to retail current to the citizens at established rates.

**SALT LAKE CITY, UTAH.**—The Utah Light & Traction Company may adopt one-man cars on certain of its lines where the traffic is not especially heavy, when the ordering of new equipment becomes necessary.

**RUPERT, IDAHO.**—Farmers in the Walcott district have received papers for the incorporation of the Walcott Electric Company. Work has begun on the line and all of the farmers in the neighborhood are arranging to "electrify" their farms in every manner possible.

**MORGAN, UTAH.**—Application has been filed with the Public Utilities Commission by the Utah Power & Light Company for permission to serve this city with electric current at wholesale and also to furnish power for industrial establishments beyond the city limits of Morgan.

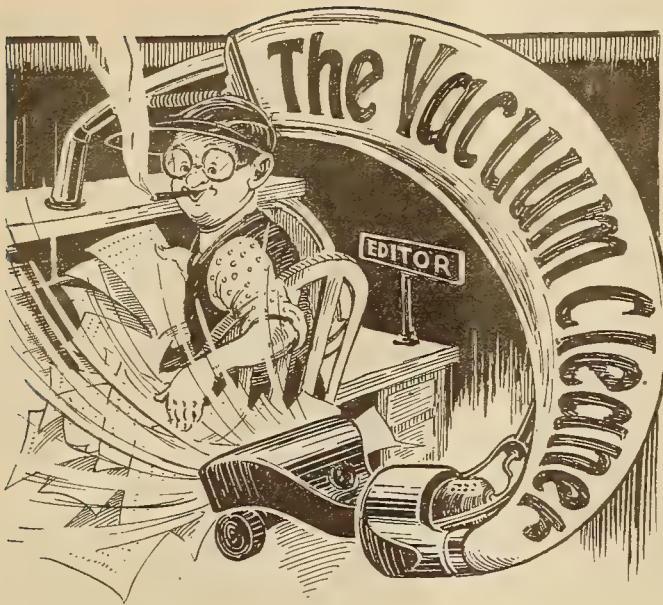
**CASTLEDALE, UTAH.**—This town, as well as others in Emery County, are very anxious to secure electric service and have petitioned the Utah Power & Light Company to extend its lines into the county. No decision has been definitely reached, but it is very probable the extension will be made.

**SALT LAKE CITY, UTAH.**—The Uintah Basin Construction Company of this city has filed application with the State Engineer for the use of 100 second feet of water from the Duchesne River for power purposes. The water will be conveyed in an open ditch 39,960 feet and then dropped over two 24-inch wheels under a head of 85 feet to develop a theoretical 964 horsepower. The power will be used to pump water in connection with various irrigation filings of the same company.

**SALT LAKE CITY, UTAH.**—Extensive plans are being made by farmers of Davis County, which lies just north of Salt Lake City, for the development of a large irrigation project, which, when completed, will irrigate 6000 acres of land. It is the intention to build a power plant and pumping station on the banks of the Jordan River at a cost of \$325,000. Application has already been filed with the State Engineer for seventy second feet of water to supplement the present supply. This project will greatly increase the values of farming property in this section.

**SALT LAKE CITY, UTAH.**—The Progress Company of Murray has filed with the State Engineer application for seventy feet of water in Big Cottonwood creek to develop 7,000 horsepower. The water will be taken from the stream below the point of return of the Maxfield Mining Company's power plant and will be used under 1,200 foot head to turn eight wheels 72 inches in diameter. It will be returned to the stream above the intake of the Utah Light & Traction Company. This water will be supplemental to the thirty second feet filed on about a year ago.





Making the streets safe for automobiles is a noble work which has received but little attention. The following rules for pedestrians have been suggested:

1. Pedestrians crossing streets at night shall wear a white light in front and a red light in the rear.
2. Before turning to the right or left they shall give three short blasts on a horn at least three inches in diameter.
3. When an inexperienced automobile driver is made nervous by a pedestrian, he shall indicate the same, and the pedestrian shall hide behind a tree until the automobile has passed.
4. Pedestrians shall not carry in their pockets any sharp instrument which may cut automobile tires.
5. In dodging automobiles, pedestrians shall not run more than seven miles an hour.
6. Pedestrians must register at the beginning of each year and pay a license fee of \$5.00 for the privilege of living. There shall be no rebate if they do not live the entire year.
7. Each pedestrian before receiving his license to walk upon the streets must demonstrate before an examining board his skill in dodging, leaping, crawling and extricating himself from machinery.
8. Pedestrians will be held responsible for all damages done to automobiles or their occupants by collision.

\* \* \*

Publicity has more uses than one, and its close relation to the fuel problem in some territories is surprising, to say the least:

A special foreign trade advertising representative sent to Latin America by the Department of Commerce has a quaint report to make on experiences south of the equator. He asked a factory manager as to the source of his power. The fabricador smiled blandly. "Sometimes," said he, "we use wood, and sometimes we use coal; but mostly we burn big fat American catalogs."

\* \* \*

Fish stories are not always the monopoly of fishermen and golfers. A member of the Salvation Army, telling of the great number of hot cakes he had baked, challenged any member of the A. E. F. to match his record of large-scale production. The busy kitchen of which he told was utterly eclipsed by the following, which appeared in response to his challenge: "The range was 928 feet wide and 1,358 feet long. It took 19 firemen to keep it hot. We had 519 cooks and 700 K. P.'s. We mashed potatoes with a pile driver and ground our coffee with a 350 hp. Liberty motor. They hauled our dirty pans on railroad cars and the K. P.'s went

about on roller skates. As I was mess sergeant, I rode up and down the kitchen on a motorcycle shouting orders through a megaphone. Now the flapjacks—we mixed our batter with twelve concrete mixers, had a steam shovel moving egg shells away from the door and six K. P.'s with bacon rinds strapped on their feet skating over the griddle to keep it greased."

\* \* \*

Proverbs for the street-car rider, evidently compiled by a commuter at Christmas time, are as follows:

He who spreads himself out across the aisle shall be humbled, and he who strives to make room for all shall be exalted.

Blessed be he who giveth up his seat unto a lady, but scorned shall be the fellow who hideth behind his newspaper.

He that standeth upon the platform and emitteth poison gas from a noxious weed is an abomination unto his fellow passengers.

The wrath of many who wait shall descend upon the head of him who hath not his fare ready.

A wise one is he who goeth forward in the car, for he shall be rewarded with a seat.

And he that standeth in the aisle blocking the passage of other patrons, shall merit the disdain of his fellows.

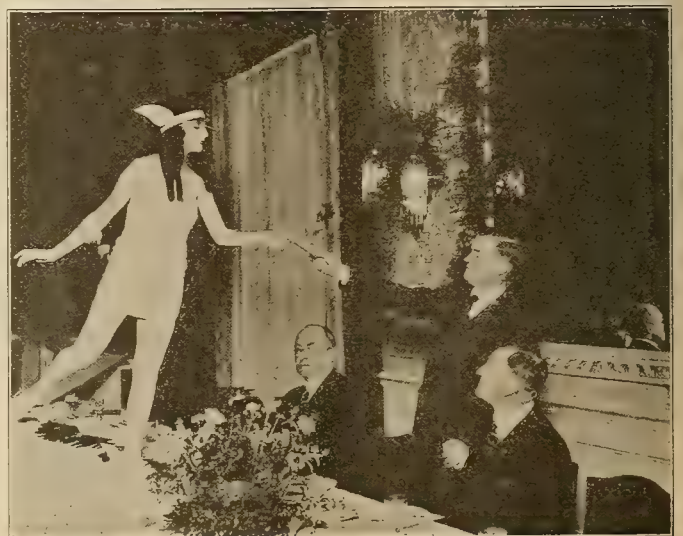
Blessed are those who hand transfers unfolded, for by such is the service improved.

\* \* \*

In the far-off days, before the invention of pure food laws and taxicabs, a Londoner once remarked that you could always tell what sausages were made of by putting them in a line and then taking away the front one. If cab-horse was among the ingredients all the rest of the sausages would immediately move up one place. The only connection between that story and this is the force of habit:

There was a man  
And all his life  
He'd worked in a shipyard,  
And he had a baby  
And it was going to be christened  
And for a week  
He couldn't sleep nights  
Because he was worried  
For fear the minister  
Would hurt the baby  
When he hit it with the bottle.

\* \* \*



A feature of a recent electrical dinner. Do you recognize them?



# JOURNAL OF ELECTRICITY

VOL. 44. NO. 3.

SAN FRANCISCO, FEBRUARY 1, 1920

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**Thru Cord Switch**  
A convenient control  
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**Quad Receptacle**  
Gives four connections on dining-  
table with one lead from  
lighting circuit



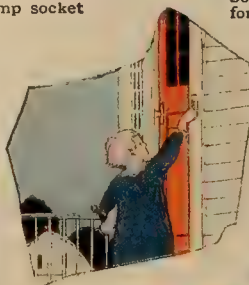
**Twin Outlet Plug**  
Gives two connections  
from any lamp socket



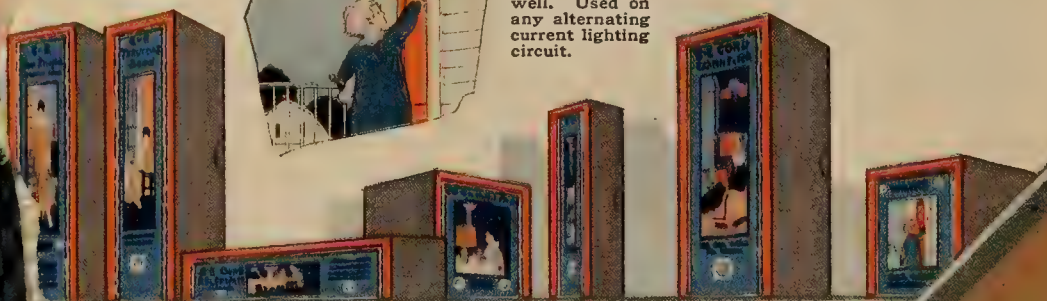
**All-Nite-Lite**  
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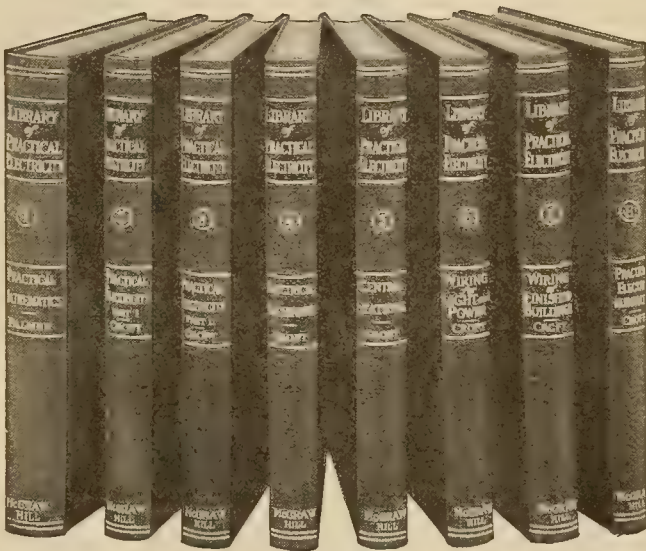


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FOUNDED 1887

ROBERT SIBLEY, Editor

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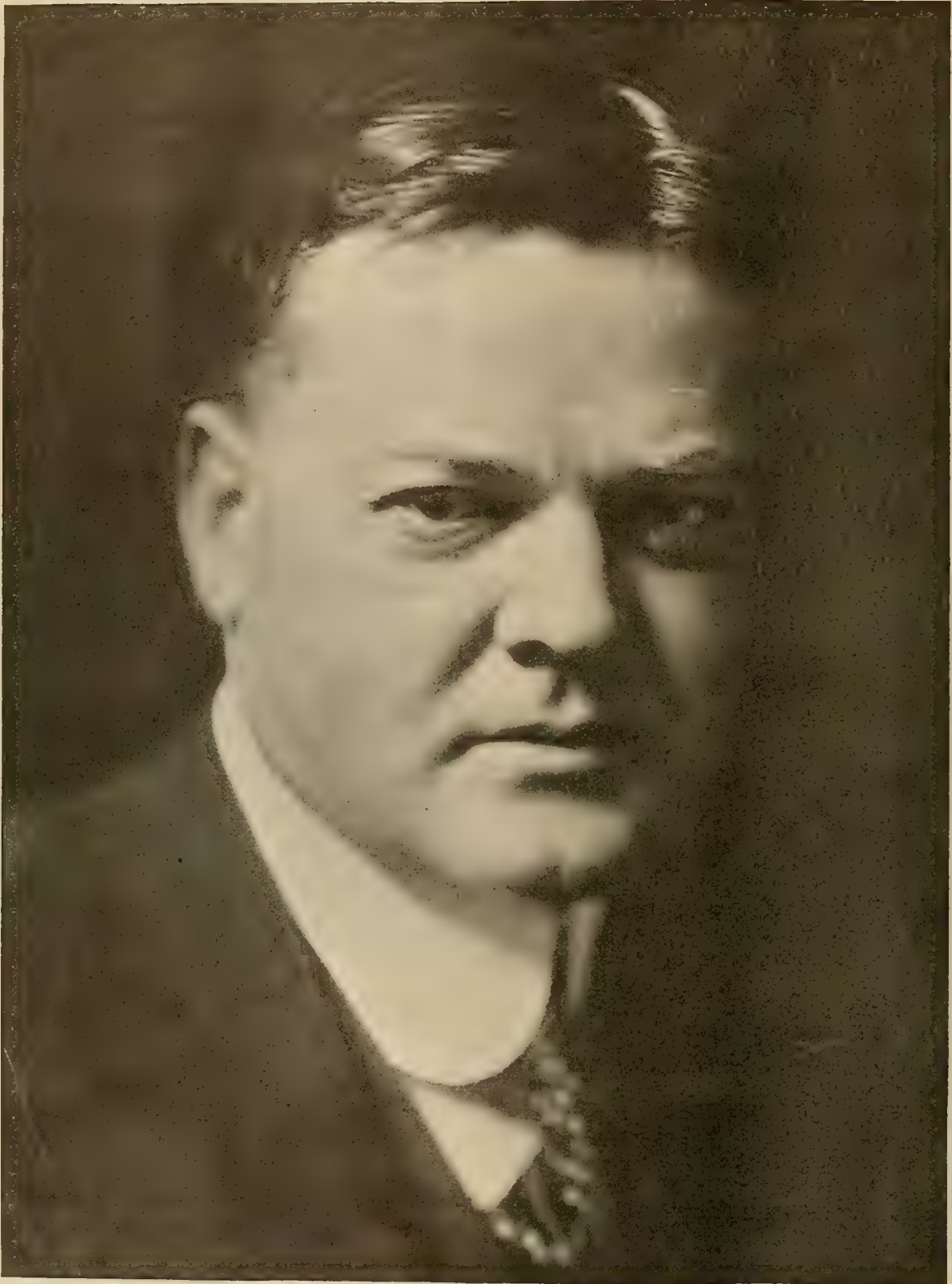
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## HOOVER FOR PRESIDENT

THERE is a certain underlying conviction running through the minds of the nation today that is asserting itself in a spontaneous burst of expression on all sides. Citizens are awakening from the tense stress of war to find a status of peace only possible under the firm direction of a quantitative mind, fully familiar with the vast economic necessities of the peoples of the world, and yet withal only possible under the vigilant direction of a mind ruled by a heart sympathetic with the world and its peoples in their present distressing dilemma.

We ask ourselves, has indeed the great war been fought, and has indeed the great world gone through its awful suffering only again to awaken to a day of pre-war conditions and pre-war atmosphere, with its old envyings, its old jealousies, and its old channels of approach to vast problems awaiting solution, still obstructed with imperfect vision?

Engineers the country over are profoundly impressed with the possibilities of an engineer president for 1920 — the first since the days of Washington. We of the West know and love Herbert Hoover, as a graduate of Stanford University, as a fellow member of the San Francisco Engineers' Club, and of many of our other professional and intellectual institutions of the West.

But while we are profoundly impressed with the fact that Herbert Hoover is a man of international reputation as an Engineer and that he portrays to the world at large a personification of the highest ideals of the West, yet it is to Herbert Hoover, the sympathetic master mind in the overcoming of the great tragedy of the war—the feeding of countless millions, and the economic rehabilitation of the world's transportation and economic channels immediately after its cessation — we look for the enthusiasm, the inspiration, and the vision to carry us through.

Experiences of the war have brought out the fact that by careful checking and testing, and drawing

### The Importance of Electrical Tests for Vacuum Valves

ing correct conclusions it is possible to manufacture machine made vacuum valves so that each valve will not only be like its fellow in physical appearance but in electrical characteristics as well. Such tests have proven that the machine made valve with its mechanically formed elements is possible of production so that more uniform results are possible than with the hand made valve. The outstanding feature of this uniformity is found to be in the fact that the single operation of machine forming retains its shape better under the subsequent heat treatment.

On another page of this issue may be found interesting tests on this subject by Captain R. W. A. Brewer, who acted as inspector for the British government during the war period in the manufacture of large quantities of vacuum valves produced in San Francisco, California.

In the article referred to, the vacuum valve is discussed with reference to its application as an

amplifier of radio signals, and stress is laid upon the desirability of obtaining audible rather than intense sound.

The principles governing the operation of thermionic currents are touched upon and the reasons why a "hard" or high vacuum valve is more suitable than a soft or gas filled valve. The effect of ionization in a soft valve is discussed and the method adopted for counteracting its effect is explained. Detailed dimensions are given of a standard form of French valve and the performance of this type of valve on some tests is shown by figures and graphs.

Methods are shown of making certain tests to ascertain the correct placing of the elements on the valve. The electronic generation and flow are indicated graphically with regard to the function of filament current and anode potential.

Saturation is discussed and graphically indicated, as also is the effect of drop of plate potential with increase of electronic flow or decrease of valve resistance.

The conclusions to be drawn from this article are that a uniform product of this delicate nature



can be produced commercially provided that careful attention is given to the details. That when close inspection is carried out the hard valve will function uniformly when it has passed the prescribed major tests.

The spirit of optimism that pervades industry throughout the Nation, is well reflected in the New Year's letter which has recently been sent out by James H. McGraw, president of the McGraw-Hill Company, publishers of the Journal of Electricity and its ten companion engineering papers.

The trials of the past three months that came into the life of most publishers of national periodicals are well known to the public generally, and as a consequence excerpts from this message breathe to industry at large a message that is timely and helpful:

"Despite all the turmoil which we have been through during the year, I approach the New Year in a spirit of optimism. The worst, I believe, is over. There are still difficulties ahead, but the world is settling down to work, and with increased production and the sobering influence of earnest work will come that peace of mind which the world so sorely needs. Except for its salutary lessons, let us forget the year 1919 and turn the new hope to the new year that is dawning.

"It can, and should be a wonderful year. With a shortage in all lines, which means abundant work for all, there should be great prosperity. In the resulting reconstruction the McGraw-Hill Engineering Publications should play an increasingly important part. We serve the country's fundamental industries. To live up to our opportunity and to become more and more effective, each one's thinking must be quickened and the highest intelligence applied to each and every task.

"I have spoken before of my hope that all of our work will become of "Tiffany" quality. We should be satisfied with nothing less. May I ask each of you to work to that standard during the coming year? Let us make the service of our publications above criticism. Then shall we receive the reward which the world ungrudgingly gives to excellence."

The application of electricity in the shipping industry has received great impetus upon the Pacific Coast. Especially in the development of the electric propulsion of ships has this region held a prominent place. The collier "Jupiter,"

first of the electrically-driven ships of the navy, was constructed at Mare Island Navy Yard, and recently there was launched at that station the dreadnaught "California," electrically propelled and electrically equipped throughout, a capital ship of 32,000 tons displacement. The mighty flagship of the Pacific Fleet that guards our coastline is the famous "New Mexico," equipped in manner almost identical to the "California."

Nor is this electric propulsion to be applied only

to ships of war. Commercial shipbuilders perceive the immense advantages of this modern method, and authoritative reports are to the effect that they are preparing to install turbo-electric drive on a considerable number of steel and wooden ships to be built within the year at Pacific Coast shipyards.

In the operating and directing of ships, electricity is coming more and more into use on this Coast. New methods in ship-wiring are constantly worked out, and great interest is being manifested in electric arc-welding in the various shipyards. Radio development, so vital now to the activities of the merchant marine, owes much to Western enterprise and invention. In the entire shipping industry the method electrical is steadily gaining ground, and in the present issue of the Journal of Electricity are recorded some of the more recent accomplishments pertaining to this important factor in Pacific Coast progress.

The recent injection of Einstein's theory into considerations of the constitution of matter in a more definite manner than formerly, due to an observed deflection of rays of light from straight line paths as they pass from stellar bodies beyond the sun toward the earth's surface, has given added interest to a discussion of the fundamental laws upon which the science of engineering is built.

For a number of issues past the Journal of Electricity has been running serially a most important series of articles on the "New Physics," by Dr. A. C. Crehore, formerly of the faculty at Cornell University, a man of international reputation as a physicist and one of our best known authorities on the constitution of matter. On another page of this issue Dr. Crehore has checked up his new theory of matter, taking into account the speed of electrons and using values for his constants derived by experiment that sheds new light on the possible necessity for a revision of the well known gravitational constant used for years by astronomers in their computations relating to problems involved in the study of the planets, comets, meteors and other stellar phenomena.

It will be recalled, according to Newton's great law of gravity, that the force with which mutual attraction is exerted between two bodies is proportional to the product of their masses and indirectly proportional to the square of the distance between their centers of mass. To express this force in numerical values agreeable to our system of absolute units of measurement, it has always been necessary to introduce a constant  $K^1$ , known as the gravitational constant, which has a numerical value of  $666 \times 10^{-10}$ . In order that the new theory of matter as developed by Dr. Crehore should prove consistent with accurately established physical constants, this gravitational constant needs to be increased numerically by about five per cent. Since there is more confidence placed in the numerical values of the other constants that enter the equation it seems likely that the gravitational constant must be increased in value over that hitherto given to it.



In engineering practice this modification in value of the gravitational constant would have but small significance. Should recent enunciations prove practical in attempting to fire a projectile to the moon computations involved would, of course, have to be slightly modified. In philosophic reasoning as to the ultimate constitution of matter the question has, however, vast importance. Readers of the Journal of Electricity will, as a consequence, find an unusual treat before them in following succeeding articles that are to appear by Dr. Crehore on the New Physics.

The appearance of a handsomely printed New Year's Greeting entitled, "The Principles of Prosperity," which turned out to be nothing but the recital of the Ten Commandments, has caused considerable comment in the electrical industry throughout the West during recent weeks. Blasphemous, some have pronounced it, while others have apparently been shocked that things sacred in religion should thus be put out to the trade. Frankly put, these were the emotions that came over the editorial staff of the Journal of Electricity before the full meaning of the message was received.

The more we think upon the subject, however, the more appropriate seems to be this method that has been so widely disseminated throughout our industry. Long since the business world has accustomed itself to claim the Golden Rule as the fundamental principle for constructive business building. The great commandments, first enunciated by Moses, while accepted as the underlying ethical standards of modern civilization, have too often been held and cherished at the church meeting and quietly hung in the closet with the Sunday clothes on the Sabbath evening to be laid aside for application until the following Sunday service. The only value that a principle has to humanity and to business is the life practice it enforces upon those who truly and sincerely believe in its demands. Such sincere life practice creates in fact as well as in theory the only true value there is, and as a consequence we endorse most heartily any movement that truly and sincerely is set in motion to put more into daily activity such principles of prosperity as are enunciated in the Ten Commandments.

Perhaps the most prosperous year in all the history of the West, is the verdict of economic experts in commenting upon 1919. Typical of the immense material development which this twelve-month period has seen is the phenomenal growth of the wealth and industry of California, largest of the Western states. The total value of all field crops produced in California in 1919 was \$284,483,000; the value of all fruit crops, \$234,813,000; of melons and vegetables, \$16,200,000. Mineral products for the year amounted to \$182,463,000 in value. The total figures for manufacture are not yet available, but are being accurately compiled by

the United States Bureau of the Census. It is definitely known that they will far exceed those of any previous year.

Intimately connected with the general trend of prosperity and development, and presaging an even greater expansion in the coming decade, are the figures announced in this issue of the Journal of Electricity by Captain Charles H. Lee, president of the State Water Commission of California. Applications for unappropriated waters during the past year show an increase of nearly 40 per cent over the average for the past five years. During the last six months of 1919, applications were filed contemplating irrigation of 2,140,000 acres—22 per cent of the total irrigable acreage of the State for which water is available, and more than one-half of the present irrigated area. In the same six-months period, applications were received for permits to divert water to generate 2,103,000 theoretical horsepower, largely on streams tributary to the San Joaquin Valley. This constitutes about 26 per cent of the maximum ultimate power development of the state. No wonder that the West is optimistic. It can back up its feeling of confidence with solid statistics.

The lease of the properties of the Sierra & San Francisco Power Company to the Pacific Gas & Electric Company, for fifteen years, has been approved by the California State Railroad Commission. The total rentals for this period amount to \$2,000,000. This merging of interests under the terms of the lease is in accordance with the trend of public utility unification in the West, which appears to be accomplishing much in the way of economy and better service. Certainly in this case, in the words of the Commission's expressed opinion, "the lease is distinctly in the interest of the public," and it is pointed out that for nearly two years the Sierra company has been unable to sell its bonds, and thus handicapped, has not been able to install very necessary power plants and transmission lines. As a result of the lease, service improvements will follow which will be of decided benefit to those territories in which the company has operated—which embrace both central coast and mountain counties of California, including the famous Mother Lode mining district. The Sierra company has also supplied power to the United Railroads of San Francisco, fully 62 per cent of its earnings being from this source.

It is truly gratifying to the electrical industry to learn, immediately upon the merging of the Sierra company, of the appointment of H. F. Jackson, president of the Sierra & San Francisco company, to the position of vice-president of the Pacific Gas & Electric Company, and assistant general manager in charge of electrical construction.

The West needs to retain men of energy and capability, and the Journal of Electricity welcomes the announcement that Captain Jackson's activities will still be devoted to the upbuilding of the electrical West.



# Structure and Operation of the Vacuum Valve

BY ROBERT W. A. BREWER

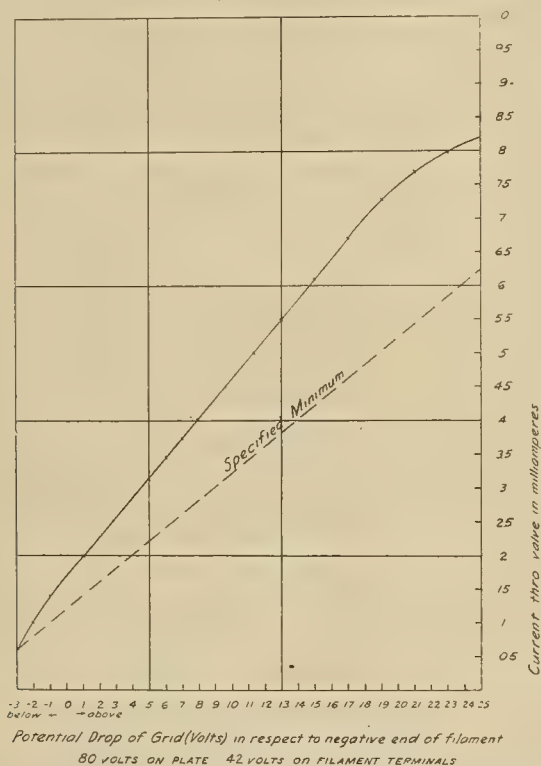
(Successful wireless communication and multiplex telephony depend absolutely upon the reliability and permanence of the vacuum valves used. Private commercial use of these communication methods is at present being delayed owing to the difficulty of obtaining satisfactory vacuum valves; those obtainable are unsatisfactory, due to the variation in their constants. The author, who has recently been in charge of the electrical inspection work of the British army in the West, brings out some of the features upon which depend the uniformity of such valves, that came under his observation as a research engineer.—The Editor.)

The type of valve which forms the subject of these notes is that generally known as the "French" valve. The results of a few typical tests are presented in the form of graphs which have been made by the writer and are taken at random from a large amount of similar data which he has prepared from results of his personal work. This work was undertaken in order to check up the possible uniformity

means of the valves discussed, in spite of the close proximity of several high powered arc stations transmitting simultaneously, the speech being distinct and clear through the interferences.

## Principle of Operation

The principle upon which the vacuum valve operates is that of electronic emission from a hot cathode producing what is known as a thermionic

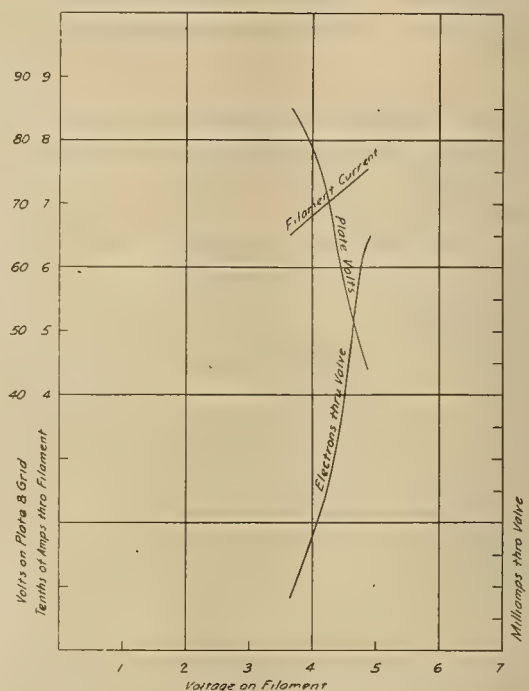


A P.D. of 30 volts is impressed upon the anode with respect to the negative end of the filament and a local current is passed through the filament at a voltage of 4 across its terminals. The grid is then subjected to varying voltages between -3 and +25, the filament to plate current being plotted as shown in the above curve. Fig. 1.

of production of these valves in the method which was devised, also to determine the effect of various errors or departures from the linear dimensions and methods of treatment originally prescribed, so that the limits of such errors could be adhered to.

A few general observations upon the vacuum valve will be useful to the reader who is not fully conversant with the subject.

Primarily, when used as an amplifier of radio signals its function is to render audible such vibrations as otherwise could not be discerned. This type of radio signal may be beyond ordinary audibility, either by reason of its weakness or on account of interference or jamming. There is no particular merit in an amplifier producing a superlative noise, which only militates against the life and usefulness of the apparatus employed. The writer has, however, transmitted speech and received audible signals by



Curve showing fall of voltage on grid and plate with increase of flow through valve. Fig. 2.

current of negative electricity from the cathode to the anode. Negative electrons are emitted from the cathode in quantity governed by the temperature of the cathode when its dimensions are fixed.

The emission of electrons necessitates the absorption of kinetic energy which has to be supplied by the battery in circuit with the cathode, the group consisting of a filament, say, of tungsten, a six-volt battery and resistance.

The original Fleming valve comprised an anode as the second element upon which a positive potential was impressed by means of a separate battery, the circuit being completed through the valve to the negative end of the filament. The anode when positively charged attracts the negative electrons emitted from the hot cathode. The electronic flow through the valve bears a relation therefore to the positive potential of the anode, and as this is increased so will the electronic flow increase until saturation occurs.

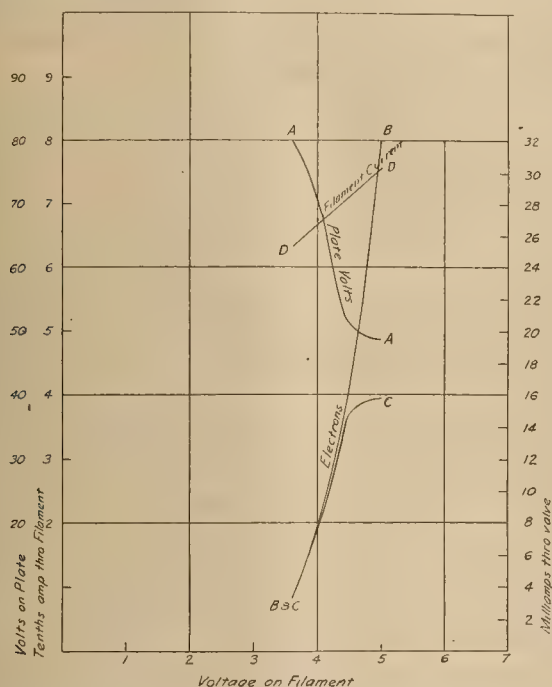
The capacity of a valve which is purely electronic depends upon the rate of emission of electrons

\*The word "Plate" is used to express "Anode" and "Filament" to express "Cathode."



from the cathode which is a function of its temperature and the rate of flow to the anode which is a function of the positive potential of the anode.

Distinct from the purely electronic, or as it is termed the "hard" valve, is the older type of "gas"



Curve showing fall of voltage AA with use of filament current DD and electronic flow CC, grid being disconnected and 80 volts initially impressed on plate. Also electronic flow BB with 80 volts maintained on plate alone. Fig. 3.

valve or "ionizing" valve in which a different action occurs. If gas is present to the extent that 1/100,000 mm. of mercury pressure exists, ionization of this gas takes place, the molecules of gas come in contact with the positively charged anode and themselves assume a positive charge, and are consequently repelled from the anode and bombard the cathode, causing the rapid destruction of the latter. The presence of gases in a vacuum valve cause the formation of positively charged ions plus negative electrons and the latter supplement the electrons emitted from the cathode, thus increasing the electronic flow. A gas valve, therefore, shows on test a greater current flow than a hard valve but its behavior is very erratic.

For this reason a hard valve is preferred in practice, in spite of the difficulty of removing the occluded gases from the metal parts and the glass bulb which form the elements of the valve.

The third or controlling element in a French valve is the grid which is interposed in the electronic path. Its function is to control the current flow through the valve by reason of its variation of potential. The presence of the third element introduces great possibilities, as slight variations of impressed voltages upon it can either check the current flow entirely when acting in opposition, or increase the flow many fold when a positive potential is impressed upon it.

If gas is present in a valve, positive ions are formed between the grid and the cathode, and these reduce the space charge inside the grid and increase the current flow through the valve to such an extent

that the action of the grid for its intended purpose is neutralized. A negative charge has therefore to be placed upon the grid to counteract this effect.

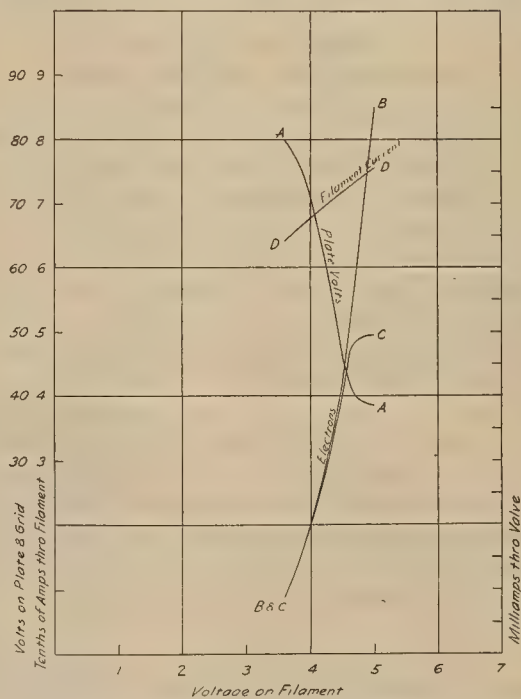
### Factors in Construction

In a hard valve the grid assumes a certain positive potential, but it must not be too coarse in construction or it will require a large negative potential to be impressed upon it to make it operative under certain conditions. On the other hand, too fine a construction must be avoided, in order that it shall not form a complete obstruction to the electronic flow. The grid, however, should be placed as near to the cathode as possible. The size of the anode depends upon the desired capacity of the valve as if this element is too small it will become red, or even white hot, due to electronic bombardment.

The dimensional details of the valve under consideration are as follows:

The anode is nickel sheet bent into a cylinder of 10 mm. external diameter by 15.2 mm. long and 0.2 mm. thick. It is supported in position by a small nickel angle piece to which it is spot welded; the angle is welded to a platinum wire for sealing into the glass bulb and to a copper connecting wire.

The grid is a nickel wire 0.25 mm. diameter formed into a series of 11 coils of 4.25 mm. internal diameter. The coils are spot welded to a nickel



Curve showing fall of voltage AA with use of filament current DD and electronic flow CC into grid and plate shorted at 80 volts initially impressed. Also electronic flow BB with 80 volts maintained on grid and plate. Fig. 4.

supporting wire at three places. The filament consists of a crimped tungsten wire 23 mm. long between supports, and of such a length that the current passing under P.D. of 6 volts at its terminals is 0.84 amps.

### Tests of Correctness

These three elements are arranged concentrically and the characteristic curve No. 1 shows graphically the behavior of the valve under the following



tests, with the object of certifying the correctness of the disposition of the elements within the valve.

A P.D. of 80 volts is impressed upon the anode with respect to the negative end of the filament and a local current is passed through the filament at a voltage of 4 across its terminals. The grid is now subjected to varying voltages between  $-3$  and  $+25$  and the filament to plate current read off and plotted as in Fig. 1. These values are required to show a straight line between the aforementioned limits and to have an increment of a minimum of 0.2 milliamperes per 1 volt of grid P.D. variation.

The characteristic curve of a valve of the receiving type according to Langmuir's formula should show:

$$\text{Plate current} = A (V_p + K V_g)^{3/2}.$$

A being a constant.

K is a constant depending upon linear dimensions of the elements and their arrangement.

$V_p$  and  $V_g$  are the potentials of the plate and the grid.

The plotted curve for a French Valve (Fig. 1) passes through observed points at intervals of one or two grid volts which are located along the abscissæ, whilst the ordinates indicate the value of the electronic flow through the valve in milliamperes of filament to plate current.

When no voltage is impressed on the grid the current is 1.7 milliamperes and this is reduced to 0.6 milliamperes when a negative charge of three volts is placed upon the grid. The form of the curve indicates that minus four volts applied to the grid would stop the current flow by building up a space charge of sufficient magnitude for that purpose. Under these conditions the valve will be inoperative until the negative potential of the grid is eliminated. The dotted line starting from the lowest observed reading gives the locus of the curve of the desired minimum current flow having an increment of 0.2 milliamperes per one volt rise of grid P.D. The actual test shows that the valve in operation exceeds this increment, and that the curve is practically a straight line, all the observed points lie exactly on the line as plotted. This test shows that the grid controls the valve action in a perfectly regular manner.

The emission of electrons from a heated filament has a critical point where very slight increase in the temperature of the filament will cause a great increase in the emission. As an example, in the first valves made the filament current was 0.83 amps. at 6 volts, 0.65 amps. at 4 volts, the critical voltage being 4.2.

The most useful test of the correctness of manufacture of a receiving valve is that for the filament-plate current when the grid is externally connected to the plate and a voltage impressed upon them with respect to the negative end of the filament.

Fig. 2 shows results of such a test graphically, but the plate voltage has been permitted to drop as the valve current increased. This drop is due to the decrease of internal resistance of the valve caused by an increase of the bombardment of negative electrons emitted by the hot cathode. The method of making this test is to start the filament voltage at a point where valve current begins to flow appreciably, in this instance 3.6 volts on the filament

produce 0.65 amps. through it, and cause a valve current of 3.2 milliamps. when 85 volts are impressed on the grid and plate shorted together.

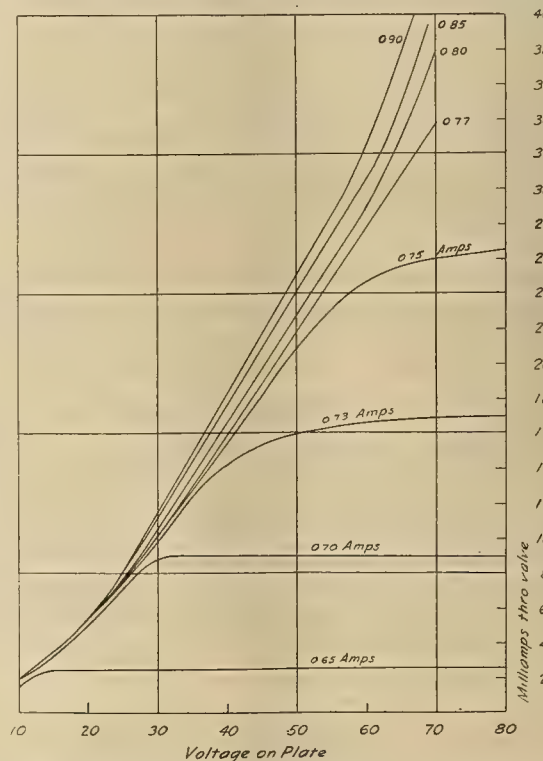
The rheostat in the plate circuit has remained untouched as the filament voltage was increased, so that at 4 volts and 0.68 amps. in the filament circuit the electronic flow has reached 6.8 milliamps. and the plate voltage has dropped to 78.

These observations were discontinued at the point where the filament voltage was 4.9, the current 0.76 amps. and the valve current 26 milliamps. with 44 volts impressed on the anode.

### Operating Characteristics

Fig. 3 shows the fall of plate voltage AA accompanying a rise of filament voltage DD and an electronic flow CC when the grid was disconnected and 80 volts initially impressed on the anode. Also the curve BB shows the increased electronic flow when the plate voltage was maintained at 80 volts. This series of curves should be compared with others taken from the same valve in Fig. 4 in which the grid was shorted to the plate. In this instance the effect of the grid is shown as increasing the flow of electrons CC and consequently causing an increased drop in the plate voltage AA. The grid acts as a second anode, and being close to the filament produces an increased strain. This strain is so marked that the writer has observed the lateral distortion of the filament when the plate voltage has been switched on and in some instances the filament has been drawn into the grid and shorted by this action alone.

Fig. 5 is interesting as being typical of the electronic flow through a valve of two elements. Several series of observations from a hard valve are here plotted, the grid being disconnected and a definite current passed through the filament whilst the



Curve showing electronic flow through valve with grid disconnected, and plate voltage increased by steps with filament current constant at various values from 0.65 amps. to 0.90 amps. Fig. 5.



plate voltage was increased step by step. The test was then repeated with an increased current through the filament and so on at varying filament current values between 0.65 amps. and 0.90 amps. The plate voltages adopted in these tests started at 10 volts and were gradually increased by steps to 80 volts, in the four lower sets, and 70 volts in the four higher sets.

The outstanding facts from this series are that a current flow of 0.65 amps through the filament does not cause an appreciable electronic emission, the 2.5 milliamps current indicated is drawn to the plate when 15 volts are impressed thereon, the valve then becomes saturated. Any further increase in plate voltage whilst setting up an additional strain in the valve, does not increase the electronic flow.

When the filament current is increased to 0.70 amps. and the plate voltage is 30, saturation occurs and the slag may be assumed, but this is not very marked. Between a filament current of 0.70 amps. and 0.80 amps. the critical temperature is reached and very marked increases of electronic flow are observed for slight increases of filament temperature.

Within the limits of the apparatus employed it has been possible to find the point of saturation when the filament current was 0.75 amps. as a maximum. This state is shown as occurring somewhat gradually when 65 volts were impressed upon the plate, resulting in 26 milliamps. electronic flow.

The flow through the valve does not increase materially when currents greater than 0.77 amps are passed through the filament. For example, when 60 volts are impressed on the anode the electronic flow is

27.5 milliamps. at 0.77 amps.  
29.0 milliamps. at 0.80 amps.  
30.5 milliamps. at 0.85 amps  
32.5 milliamps. at 0.90 amps.

Curves such as these indicate that the operator should use as low a filament current as convenient

in the critical range so as to prolong the life of the filament, and should adopt a plate voltage just below the point where saturation occurs. Plate voltage has generally or frequently to be obtained at appreciable cost and should therefore be considered. This is particularly the case when dry cells are employed.

In these brief notes only a few of the interesting features of vacuum valves could be touched upon, and space has precluded any mention being made of the very delicate tests employed to insure correct functioning. Some of these tests involve only fractions of a micro-ampere and yet valves complying with these tests have been constructed in quantities.

The French valves under consideration have been made by hand in England in large numbers and a considerable quantity have been machine made in America.

### POWER FACTOR RATE FOR CALIFORNIA OIL FIELDS

A very advantageous load has been built up by the San Joaquin Light & Power Company in the pumping of oil wells in the California oil fields. The load factor of this type of installation is very high, but a rather poor power factor is maintained. The San Joaquin company proposes to better this condition by an installation of synchronous machinery at Taft, California, to cost in the neighborhood of \$100,000. This is found simpler to handle than individual correction of the poor power factor.

It is now proposed, and application is at the present time before the California Railroad Commission, to charge the expense of this correction to the installations which are involved, rather than to figure it in as general expense and distribute it through all rates. The proposed method involves the figuring of the kilowatt-hours affected and the calculation of operating and overhead costs per kilowatt. This would result in a very small additional charge per kilowatt to this type of consumer.



The Lake Spaulding dam of the Pacific Gas & Electric Company is 275 ft. high, and spans approximately 700 ft. It is a constant angle arch dam containing 191,500 yards of concrete, the length of the upstream radius varying from 250 ft. near the bottom to 428 ft. at the crest. It impounds a reservoir of 74,000 acre ft. capacity, behind which is a drainage area of 123 sq. miles. The elevation of the crest of the dam is 4875 ft. above sea level. The view shows the recently raised portion of the dam as well as the lack of snowfall in the high Sierra Jan. 1, 1920.



# Oil Pipe Line Transmission

BY H. W. CROZIER

(The varying viscosity of fuel oils, and the frequent necessity of heating before transmission, calls for numerous adaptations in pipe line design. The following discussion of the most efficient modern practice in the handling of this important product is by a member of the engineering firm of Sanderson and Porter, San Francisco.—The Editor.)

In making a decision as to the capacity of a pipe line to handle the several different grades of oil which in regular commercial practice would be offered, the most viscous oil is necessarily the controlling factor and the line must be designed to handle it either at full capacity if it predominates, or at a reduced rate if it is only a small part of the oil offered.

## Looping and Use of Two Sizes

When existing pipe lines are offered more oil than they can handle, an expedient called "looping" is sometimes resorted to for the purpose of increasing the carrying capacity. This consists in laying and connecting several miles of additional pipe parallel to the operating main line, and eventually additional pipe is laid until a complete second line is built. The additional pipes are called loops by the oil men, but a railroad engineer would call them second tracks.

In Eastern practice, handling constant temperature oil, it makes no difference whether the loop is cut in at the pump end or the terminal end of a pumping division, but in California hot-oil practice it makes a material difference, and the loops ought to be constructed at the terminal end and not at the pump end. The reason will be readily apparent when it is remembered that the loss of heat is proportional to the surface and is a function of the difference in temperature between the oil and the earth; therefore, if the loop is installed at the head or hot end, the heat loss will be greater and the average temperature lower. Furthermore, the added capacity is of greater advantage where the oil is colder and the viscosity greater.

Using two sizes of pipe is another variety of looping and is a very useful method in obtaining a

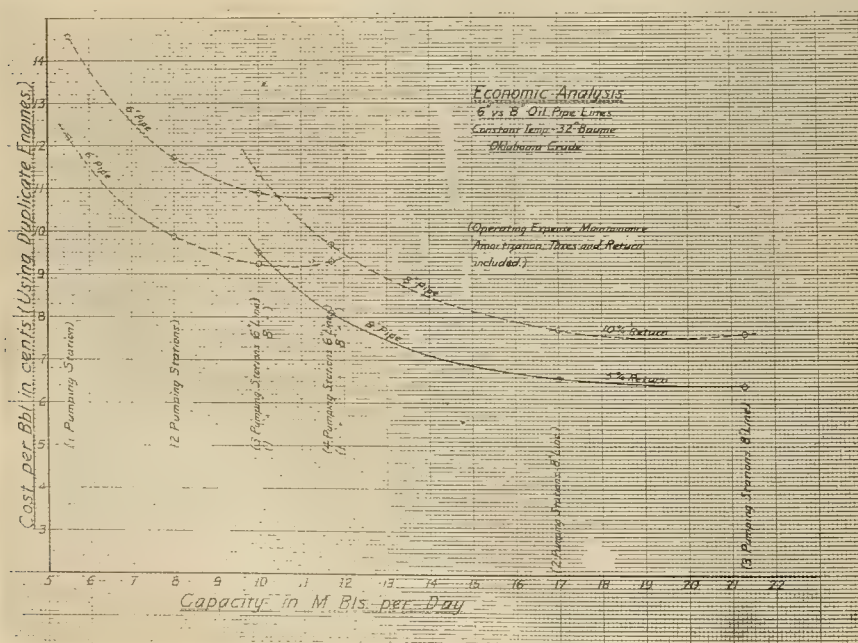
desired result at the lowest expense, particularly in original construction. In handling heavy oils, such as the California oils, very considerable economies in construction are realized by using larger pipe at the end of each division, where the oil is cold and therefore more viscous.

## Pumping Station vs. Pipe Size

It is in selecting the best ratio between the number of pumping stations and the proper size of pipe that the engineer can make the greatest economies in the construction of pipe lines. When dealing with oils under constant temperature the problem of selecting the right number of pumping stations and the right size of pipe is comparatively simple, as it involves only the calculation of several different combinations of pumping stations and line pipe sizes properly to handle the quantity of oil decided upon, and the selection of the most favorable arrangement, everything considered.

A tabulation which was prepared for the guidance of certain clients contemplating the construction of a line about 130 miles long is illustrated in graphic form in the chart. It will be noted that the maximum capacity of the 6-in. line is 11,700 barrels, requiring four pumping stations, and that by the use of one pumping station and eight-inch pipe at somewhat greater cost, operating expenses would be reduced per barrel of oil. The intersection of the curves gives the critical point below which six-inch pipe is advisable and above which it would pay to use eight-inch pipe. As a general rule this critical point will be found at a velocity above  $3\frac{1}{2}$  feet per second.

When dealing, however, with the heavy crudes of California and Mexico, which must be heated, the





problem of proper selection of pumping stations is not so simple, as there is another and very important factor to be considered, difficult of estimation, but which practically controls the situation, and that is the possibility of again starting the lines if



Oil heaters, utilizing exhaust steam. In modern stations the oil heaters are always installed out-of-doors. Practically all the heat of the exhaust steam is used in heating the oil, and there is no waste at the exhaust head.

the oil should cool off during a shut-down due either to accident or design. It is customary in all such lines to provide an auxiliary pump capable of operating at full pressure at very low speeds. In some pumping station designs the auxiliary pump is the same capacity as the main pump normally used, and in other designs smaller, as its purpose is wholly one of relay use and for starting. The practice in Mexico, where very viscous crudes are met with, particularly in connection with sea loading lines, is to install an auxiliary pump for starting, capable of considerably higher pumping pressures than the main pumps. A further consideration from the study of the temperature curves will also indicate that in dealing with heated heavy crudes, it is desirable to operate the pipe lines as near their full capacity as possible, 3 ft. per second at least, so as to conserve the heat as much as possible. Experienced pipe line operators usually move runs of heavy crudes through the lines at fairly high speed, and, if they have any spare capacity, operate slower when pumping the lighter refining oils, because it is desirable to keep the oil always moving.

#### Materials of Construction

The economic design of pipe lines is very materially influenced by the type of the materials used in its construction. The quality of the steel in the line pipe itself is of the utmost importance, and considerable thought and study has been given to the specifications covering the fabrication of the line pipe. As a general rule, speaking of eight-inch pipe, a line working pressure of about 800 pounds is good practice with the regular standard line pipe. The pressures for six-inch and ten-inch sizes are 930 and 730 respectively, not quite in proportion to the diameters, as the thicknesses are not the same in each size.

In main line pumping station design steel pump cylinders, valve pots and all parts subjected to the

line pressure are very desirable, and by the use of this material it is possible to considerably cut the cost of the pumping stations. Several important lines of recent construction have all of the parts subjected to the high pressure oil made of cast steel, or steel pipe, and when compared with pumping stations of earlier design, built when cast iron only was available, it will be realized that very considerable economies have been made. On account of the danger from cracked cylinders and other iron casting failures, two buildings were heretofore used, one for the engines and pumps and the other for the boilers. By gradual evolution this has been modified, and in modern stations the boilers and pumps are all installed in one building. The oil heaters are always installed outdoors.

In a modern design with which the author is familiar, provision was made for the erection of a partition between the boiler room and the engine room if experience should indicate its necessity, but several years operation indicates its superfluity. Such a result is obtained partly through the use of cast steel, which eliminates the risk of unexpected cracks, and partly through very careful design, particularly in regard to the arrangement of the high pressure gaskets.

#### Steam vs. Oil Engines

In dealing with heated oils, as in California, steam driven equipment is essential because of the



Steam pumping station handling heated oil. In dealing with heated oils, as in California, steam driven equipment is essential because exhaust steam is the most satisfactory medium for heating the oil. In modern stations boilers and pumps are all installed in one building.

necessity for heating the oil, and exhaust steam is the most satisfactory medium. Two types of pumping engines are now used extensively; a so-called low duty type consisting of a four cylinder compound duplex acting pumping engine with four single acting oil plungers, and having a steam economy of about 35 lb. per horsepower hour, and a high duty type, consisting of a crank and fly-wheel cross compound engine usually of the Corliss type driving the four single acting oil plungers through scotch yokes and having a steam economy of about 22 lb. per horsepower hour. Both types operate at 2 lb. back pressure exhausting to the oil heaters. Pumping stations equipped with the high duty type of engine are the cheapest because the saving in boiler capacity and buildings, more than compensates for the extra cost.



As a matter of fact, the thermal efficiency of the California stations works out very satisfactorily, particularly when economical Corliss type cross compound engines are used, as practically all the heat of the exhaust steam is used in heating the oil and there is no waste at the exhaust head. On the other hand, in dealing with the constant temperature pipe line problems of the eastern states where heating is unnecessary, the superior economy of the Diesel engines is a very important factor, and in recent lines constructed the Diesel engine driven oil pumps have been installed, realizing exceedingly high economy in operation. The steady loads of the pipe lines permit the realization of the full advantages of the Diesel engine due to the high load factor. Because of the elimination of the boiler plant and building the cost is about the same as steam equipment.

### Oil Pumps

The oil ends of the pumping units used on large oil pipe lines are very similar in design and usually consist of four single acting cylinders placed in pairs back to back, in which chilled cast iron plungers operate at a speed usually not in excess of 240 feet per minute. There has been a gradual evolution in design which has culminated in an arrangement suitable for heavy oil, wherein each pair of valve pots, containing an inlet valve and an outlet valve, is a single steel casting, bolted to the cast steel cylinder and to the cast steel outlet manifold. This de-

sign was first proposed and manufactured in California. The inlet manifold subject to only moderate pressures is cast iron. It is standard practice in California to use a double ported steel valve operating on a bronze seat. The practice of the several pipe line companies in this particular is practically identical, and in the several designs of pumping units, both steam driven and Diesel engine driven, the oil pumps are identical in design and arrangement, the only difference being in the number of valve pots provided for the various capacities. The Diesel engine designs are all geared, as it is desirable to permit the Diesel engine to make several hundred revolutions per minute. Our practice is to fit a Francke coupling between the Diesel engine and the set of herringbone gears which drive the oil pump.

### Construction

A feature of considerable interest in pipe line construction is the extensive use of machinery. The familiar trench digging machines are nearly always used, except where rock or side hill location is encountered. Pipe screwing machines, painting and enameling machines, and back filling machines have been developed to a high stage of efficiency with corresponding reductions in construction costs. Except in heavily wooded country where the cost of clearing the necessary wide swath for the machine is an important item, all pipe construction work can be done by machinery.

## Electricity on Sailing Vessels

BY LOUIS ETSHOKIN

(The increased use of electrical apparatus and electric propulsion on board ship opens up a new field, to the contractor-dealer as well as to the manufacturer and the engineer. Some of its possibilities are indicated in the following article. The author is electrical engineer with the Halcun Radio Company of San Francisco.—The Editor.)

Aboard power-driven vessels, electricity has become very important. The first uses were for lighting exclusively. Now electricity is used for steering, driving pumps, and even for propulsion itself. Thus the latest battleships like the California are entirely electrical.

Some of the finest examples of electrical development are to be found aboard ship. The Sperry gyroscopic compass is one of the most ingenious applications of electrical science which can be found. The Fessenden oscillator is another. Both have been of inestimable value to the Navy, and to merchant ships.

### Obstacles to Development

There is one type of vessel, however, which has heretofore availed itself very little of the benefits of electricity. This is the sailing vessel. The reasons for the slowness of sailing vessel owners to install electrical equipment are mostly these: There is no source of power aboard a sailing ship other than a gas engine or donkey boiler used for pumping, etc. Most sailing-ship men are rather afraid of the word electricity and still think there is something mysterious about it. They do not see how they can afford electrical equipment.

These people are in much the same predicament as the isolated farmers used to be, and they use the same arguments in opposing electricity. But farm-

ers all over the country are becoming more and more awake to the advantages of the use of electrical power.

### Improved Opportunities

Until a small, reliable gas engine was developed, electricity was not for sailing vessels. Having fire under a boiler for the sake of running a dynamo was more trouble than it was worth. But with the gas engine of today, that will run year in and year out with no attention, the question of power for the generation of electricity is solved. The question of something going wrong in the electrical equipment on board a sailing vessel is also a thing of the past. With standard marine wiring, liberal design, and good construction, nothing can go wrong on the simple equipment which a sailing vessel should have.

As to expense, there is an initial expense to everything worth having. But electrical equipment will pay for itself in saving of kerosene, lamps, and time spent in trimming lamps. It will pay for itself in immunity from fire caused by overturned lamps, in comfort and convenience for the crew, in ability to load at night, and in many other ways.

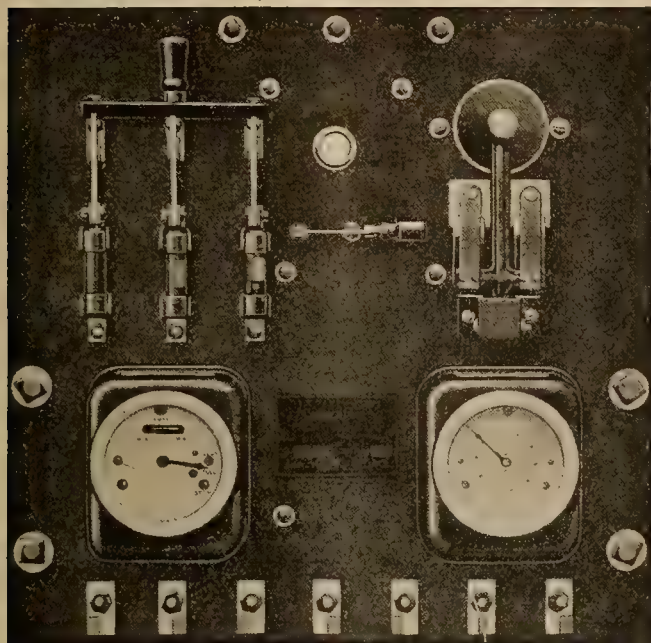
A great many sailing vessel captains are accompanied by their wives. How much more comfort is possible with electricity—heaters in cold climates, fans in warm climates, electric iron, electric percolator, and what not.



### The Question of Voltage

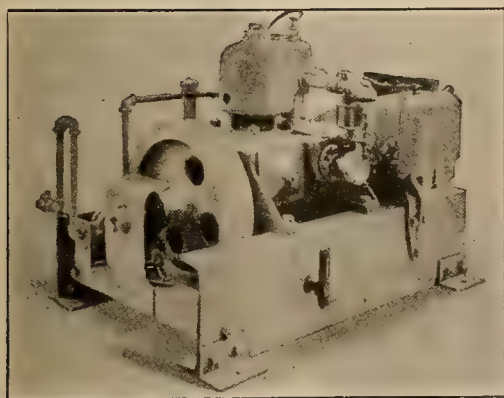
The question now arises as to what type of electrical equipment is best suited for sailing vessel use. Voltage divides equipment of this sort into two great classes, 110-volt and 32-volt. Each has its advantage and disadvantage.

For large sailing vessels, 110-volt equipment is undoubtedly superior. It is easier to get 110-volt



Switchboard for sailing vessel outfit. Marine apparatus should be such that the average mate can run it, and there should be no complicated accessories.

lamps than 32-volt. The same applies to practically all electrical machinery. All, or nearly all, dock systems are 110-volt, and this means ability to use dock electricity for the ship when in port. Wireless equipment, which the majority of big vessels will want after installing electricity, is easier to obtain at 110-



A compact marine equipment for sailing vessels. It is especially necessary that all marine electrical equipment be reliable, as repair facilities are not readily available on the high seas.

volt, although it is obtainable at 32 volts. The majority of small household electrical appliances which the large sailing vessel would want are 110-volt; 32-volt appliances are special.

For very small sailing vessels that want only electric lighting, 32-volt equipment can be used. Its only merit is a somewhat lower first cost, due to fewer storage cells being required.

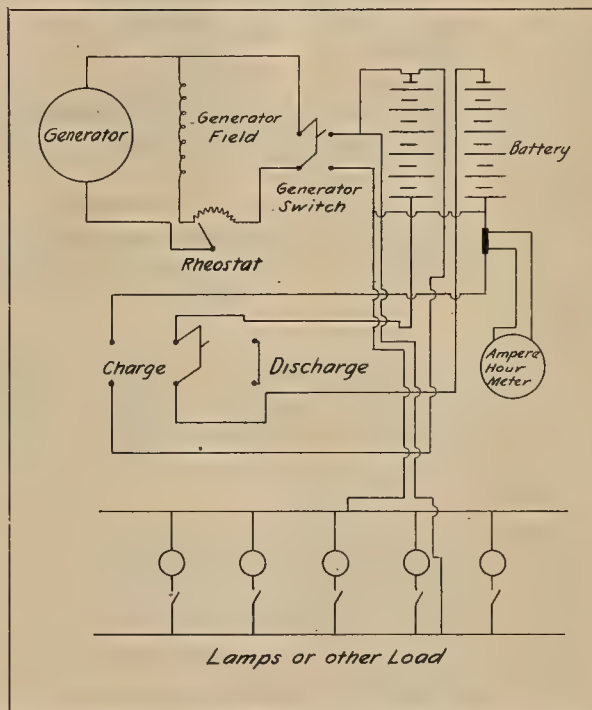
### The Six Essentials

The essentials of a good equipment for sailing vessels, in the orders of their importance, are these:

1. Reliability
2. Simplicity
3. Ruggedness
4. Durability
5. Efficiency
6. Flexibility

The first essential of any seagoing apparatus is reliability. You must have apparatus that will not fail you when you need it most. Repair shops are scarce in mid-Pacific.

The next requirement means that the apparatus must be such that the average sailing mate can run it. It must not be too complicated. Ruggedness and durability almost go together. Naturally the apparatus must be marine. Salt water is no friend of electrical or mechanical apparatus, and if the



Essential features for sailing ship wiring. Lamps can be run directly off generator, and can be run while charging. Charging can be varied over wide limits.

ordinary stationary apparatus is used for marine purposes, it will not last.

The apparatus must be efficient, so that too much fuel will not have to be carried on long voyages, and it must be flexible enough so that it can handle more load than the initial installation called for.

### A Satisfactory Equipment

These requirements are met by the following equipment.

1. A good gas engine, preferably four-cycle and of marine type, which runs without coaxing.
2. A generator of ample capacity, totally enclosed, and capable of running even under the most adverse conditions.



3. A storage battery which is not going to sulphate or hackle every time it is discharged heavily, and preferably of sufficient ampere-hour capacity to permit of the generator being run not more frequently than every second day.

4. A simple charging panel with one switch for charge and the other for discharge, and a rheostat to vary the charging and discharging voltage. An ampere-hour meter on the board to tell the state of charge and discharge.

5. Simple, substantial wiring throughout, with as little as possible above deck.

Any improvement on these fundamental necessities is desirable if it does not mean a sacrifice of dependability. Too many automatic features are not good for sailing ships unless there is also the alternative of hand operation, if the automatic device goes wrong.

It is well enough to start the engine by pressing a button, but when the engine fails to respond to the pressing of the button it is a different story, particularly in rough weather. Also, why is it necessary for the engine to start up by itself? That is ideal on a farm when the engine may be a quarter-mile from the farm house. But it is not much of a walk to the engine in a sailing ship. Generally the equipment is located near the captain's cabin. Why should he be awakened by the engine starting sometime in the middle of the night? It is better to put the cost of the automatic features into extra ruggedness.

On a great many vessels, it is necessary to run a gasoline pump each day to keep the holds dry. This same gasoline engine can be used to drive the generator, with a resultant lessening of the cost of installation.

All sailing masters who have used electricity are enthusiastic about it. It pays for itself many times over in every kind of way. Its use is becoming more and more common, and will ultimately be universal.

### U. S. S. "CALIFORNIA"

The superdreadnaught "California" was launched at Mare Island Navy Yard on San Francisco Bay November 20, 1919. This battleship is almost identical in size and equipment with the "New Mexico," and is by far the largest vessel ever built at the Pacific Coast yard.

She is 624 feet long with a breadth of 96 feet and a draft of 30 feet 5 inches, and 32,000 tons displacement. Her armament will consist of 12 14-inch guns and 38 guns of smaller calibre, with four torpedo tubes.

Like the "New Mexico" she will be electrically propelled. The propelling machinery will, however, be arranged somewhat differently. The two 13,500-kva. Curtis turbine generators will be installed in central compartments instead of the outboard compartments as on the "New Mexico." The turbine compartments will be flanked by eight boilers, four on each side, each in a separate compartment.

There will be four 7000-horsepower motors. The inboard motors will not be in the control room,

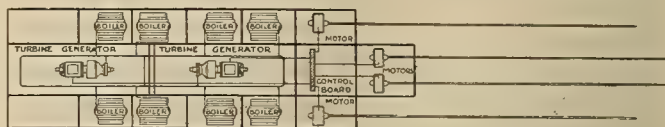
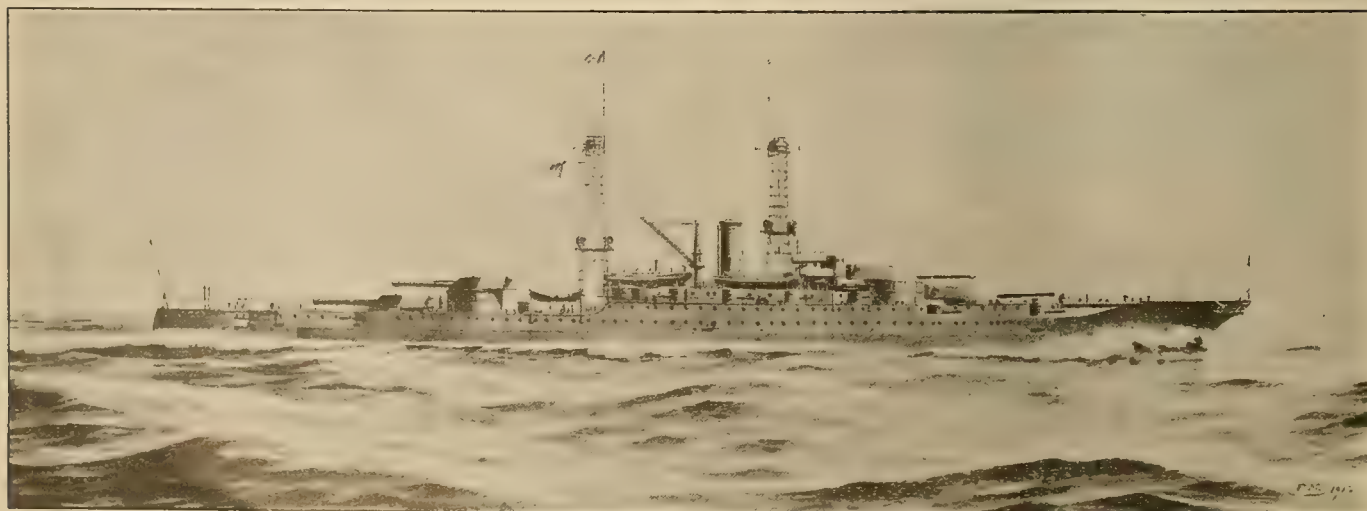


Diagram showing the arrangement of the U. S. S. California's electrical propelling machinery. The turbine compartments are flanked by eight boilers, each in a separate compartment

as on the "New Mexico," but in a separate compartment farther aft. Like the "New Mexico's" motors, pole changing switches will be used for the stator winding so that they may be connected either for 24 poles or 36 poles.

However, instead of the double squirrel-cage rotor winding with an outer high resistance, low reactance starting winding and an inner low resistance higher reactance running winding, the "California's" motors will be of the slipring type. The external resistors will be water cooled. Oil circuit breakers will be arranged to short circuit the resistors when desired.

For an auxiliary power to supply excitation and for general use aboard ship there will be in each engine room three 300-kw. direct current units. The "California" will be electrically equipped throughout from the motors operating the turrets to the potato peelers in the kitchen. The electric equipment is being furnished by the General Electric Company.



The U. S. S. California



# The Development of Electrical Installation Aboard Ships

BY F. A. ANDERSON

(The impetus given to marine development during and since the war is reflected in the steadily increasing use of electricity on board ship, with the result that special attention is being given to the types of equipment most suitable for marine use. Following is the first of a pair of articles on the subject by the electrical inspector for the U. S. Shipping Board Emergency Fleet Corporation in San Francisco.—The Editor.)

Ships have seen great changes since the day when Columbus crossed an uncharted sea. We have watched the ship grow from the sailing craft to the great steel vessel, with its engines of steam and its screw propellers.

## Beginning of Electrical Installation

Almost co-incident with the time when electricity was found useful on land it was adopted for ships, but its progress on ship board has not been so rapid. In the earlier days a one-wire system was used, in which the hull and other metal parts of the ship formed one side of the circuit. That such a system is allowed in some instances for present day service is evidenced by the following quotation from the rules of Lloyd's Register:

"The single wire system must not be adopted for any part of the installation in vessels carrying petroleum."

That electricity has not made greater progress is due in a large degree to a misunderstanding of its possibilities, and these misunderstandings develop into objections among many masters, engineers, ship builders and ship owners. To many ship's engineers everything electrical is surrounded with a cloud of mystery, which is somewhat justified, for through faulty installations trouble often develops which they cannot locate, correct, or control. But when these men understand the advantages of electrical equipment aboard ships and are converted to its use, they lack neither the courage of their convictions nor the ability to promote its adoption.

## Correction of Wrong Impressions

We must remove this veil of mystery by giving simple, plain and concise instructions with electrical equipment installed on ships. We must show the valuable service such apparatus can render; then and then only will the pathway for electrical installation on ships be unobstructed.

The present plan for ordinary cargo ships allows only about one to one and a half per cent of the total cost of vessel for the electrical equipment, but such equipment plays a far more important part than that per cent of the ship's efficiency, and is responsible for even a greater per cent in the vessel's safety and comfort.

## Specifications and Requirements

It is the general practice in ship's specification to include a clause that vessels be built to the requirements of one or more of the classification societies, and also in accordance with the General Rules and Regulations of the Steamboat Inspection Service. In that portion of the specifications referring to electrical equipment a clause is often added which requires that the installation shall be in accordance with the rules of the National Electrical Code.

Classification societies include electrical rules

which are good to a certain extent and which have from time to time been improved to meet the onward march of progress; however, they do not cover many points, and the enforcement of even their present requirements is not always possible, for they possess many alternatives and have been variously interpreted establishing precedents which it is hard to overcome.

I have already quoted from the English authority, Lloyd's Register, and will now quote from the American authority, "The American Bureau of Shipping," who in the preamble of their Rules for Electrical Installation state as follows:

"GENERAL.—All apparatus and appliances such as generators, motors, wire, switches, circuit breakers, cut outs, etc., shall strictly conform in every respect to the standardization rules of the American Institute of Electrical Engineers and the National Electrical Code and such special rules under marine construction requirements contained herein."

This has been the bulwark of strength which has enabled the electrical inspector and the electrical man of the shipbuilding industry to make the improvements and progress which have been accomplished. Much has been done. There is much more to do. Progress has been made, and progress is success.

The rules of the United States Steamboat Inspection Service are short, but they cover a wide field; one of their principal requirements is that:

"Changes or alteration in the electrical installation of vessels now in service shall be in accordance with this rule. Special attention shall be given by the inspectors in the examination of present installation to see that it is of such nature as to preclude any danger of fire, giving particular attention to wiring which is carried through wooden bulkheads, partitions, etc."

## Examples of Inferior Work

I want to cite an instance which I think thoroughly justifies such a rule. A few months ago I visited a vessel used for both cargo and passenger service, its electrical equipment had been gone over several times and at the time of my visit included wooden moulding, enameled conduit, B. X. cable and some ordinary lead encased wires. I went aboard this vessel while it was in drydock, and found that the lead encased wire had been drawn into a space between a wooden ceiling and deck for a distance of about fifty feet or over. These wires were secured only to the binding screws of the fittings at both ends of the run, leaving the slack of the heavy wires ample space to swing with the movement of the vessel, and some of the connections had been broken from the fittings by such action. The B. X. had been bent around such short radii that the casing was partly imbedded in the insulation of the wire, causing in some instances complete short circuits where most crude repairs had been made; wires entered and left the enameled conduit without the use of proper fittings; in several instances charred



places were found in and around the wooden moulding. I learned that there were four known fires which had originated from the electrical installation on this vessel, yet this rule of the United States Steamboat Inspection Service was not obeyed at this time, and the vessel again proceeded to sea with only "necessary repairs to the electric installation" having been made, and these consisted chiefly in patching over the defective parts.

There is another instance, which parallels the former in almost every detail, but with some added faults, for here wires were carried through wooden partitions without any protection whatever, many of them being to outside connections subject to weather conditions. This was on a ship built within the past two years, much of its electrical installation was exposed to mechanical injury and willful destruction. Many of the present day rules were disregarded, yet the work was done by an electrical contractor experienced in ship's work.

### Conduit Installations

The generally accepted best practice of today for ship's wiring is the conduit system, using so-called steam tight fittings below main deck and in other places subject to moisture, weather, etc., while throughout other portions of the vessel ordinary house wiring appliances are permitted and used.

In many instances the conduit is not required to have the non-corrosive metal coating, although it is a commercial product of today and is required in many places where the danger of corrosion is not nearly so great as in the salt sea air and other conditions prevalent aboard ship.

### Lead and Armored Cable in Government Work

The electrical installations under the U. S. War Department at seacoast fortifications were the first of the open work type using ordinary painted boards secured to the concrete structure; on these boards the knobs or cleats secured the wires in position. The life of such installations was short indeed. It gave way to the conduit type which flourished for a time, but the excessive condensation present in these fortifications soon filled the conduit with moisture, destroying the insulation of the wires superinducing electrolytic action, and producing the rapid corrosion of the conduit on the inside, with the resultant breakdown of the system. The next advance was the lead covered cable, the first type being the old flat duplex. This seemed to overcome some of the difficulties, but it was soon found that conditions existed which caused the lead to disintegrate and destroyed the insulation. Then followed the lead and armored cable. This cable was made circular in form by using jute fillers. The lead was covered with a material to protect it from deterioration over which a galvanized iron wire was laid. This type of installation proved the most satisfactory and is the one in present day use. Some of these installations have been in successful and satisfactory service for the past nine or ten years, and without a reported failure, justifying the adoption of the type and proving its economy regardless of first cost. Following this the Navy Department came to a lead

and armored type of cable for installation on ships. There are slight differences between the War Department and the Navy Department specifications for insulation and a marked difference in the armor of the cable. Generally the War Department requires galvanized steel wires laid spirally around the lead casings, while the Navy Department use the basket weave type.

### Breakdown of an Up-to-Date Installation

There recently returned to its home port a ship which was built and delivered but a few months ago. The electric installation had been made in accordance with the accepted present day practice. It was installed by competent men, the man in charge being considered especially thorough in his line of work. Tests were made to locate possible faults and everything was done to see that the whole installation was free from defects before the ship left on its maiden voyage; yet, upon return to the home port over fifty developed grounds were found in the installation.

### Present Type, Ship's Fittings

The so-called steam tight fittings which are generally used are more of a type than an actuality, for it is rare that the abutting surfaces are machined true. Sometimes these surfaces are ground, but quite frequently they are left in their original cast state, depending wholly on an interposed rubber gasket to form the seal. This is not always accomplished, for high and low spots occur which admit the air, saturated air enters, condensation takes place and accumulates in recesses and low spots when deterioration of the insulation begins. Other types of these fittings depend on the glass steam tight globe. Here again is opportunity for failure, these globes are often cracked or broken and, in many instances, are removed entirely from the fitting, which opens the system and defeats the object for which the expense of a steam-tight installation was incurred.

In some installations fittings of the non-water-tight type are installed with improvised gaskets, or other means of converting them into a water-tight type.

It is not unusual to find over sixteen different types of boxes and covers on one installation.

### Present Type, Ship's Wiring

The general method of wiring ships contemplates running several circuits in one conduit. This is a practice permitted under present rules of the classification societies, and also the National Electric Code. It is to my mind a mistake for ship's installation.

Present equipment includes running circuits through cargo spaces or holds. The undesirability of such practice is evidenced by the following quotation from the Rules of the American Bureau of Shipping:

"The method of distribution for cargo spaces must be such that each freight compartment is separately controlled outside the compartment so that the electrical current shall be cut off when the vessel is underway."

The correction of this permitted practice will, I believe, greatly improve installation.



# An Electrical Signaling Method for Guiding Ships

BY R. H. MARRIOTT

(Since the advent of the electrically propelled ship, the application of electricity to marine purposes has made great strides, and is doing much to increase safety and efficiency on the sea. The author of the following account of an interesting device is expert radio aid with the 13th district radio materiel officer, U. S. Navy Yard, at Puget Sound, Washington.—The Editor.)

It is evident that vessels have not had means for sufficiently accurate guiding in narrow channels, dangerous channels, and in fog. Largely for this reason many vessels have been lost or delayed. For example: one hundred and sixteen vessels have been lost in Alaska waters north of Ketchikan. Many vessels are held up for considerable periods of time at harbor entrances, for example at New York harbor entrance, where the financial cost for delay may amount to as much as \$500 per hour for one vessel. It is believed that re-occurrence of such losses may be prevented by the following method:

## A Signal-Carrying Conductor

Install a signal-carrying conductor along the sides of the channel or under the channel and pick up the signals on the vessel. For example, when conductors are on each side of the channel, guide the vessel so the signals from the starboard conductor are slightly louder than those from the port conductor. When two conductors are under the channel, one for inbound and one for outbound, keep the inbound vessel in the course that gives loudest sound indicating the inbound guide. The under channel guide would probably be more practical.

The ship receiving device may consist of a coil of wire on an iron core attached to the bottom of the ship with the core athwartship for receiving from a submarine signal wire or vertically to the side of the ship for receiving from a wire parallel to the channel. The winding of the coil may be connected to a pair of telephone receivers worn by the helmsman or navigating officer, or one pair of telephones for each of the officers. Where conditions will permit, the signal may be the spoken word "In" for the inbound channel and "Out" for the outbound channel.

## Signal Codes

If desirable and conditions permit, different frequencies of alternating or pulsating current may be impressed in the guide conductors. One frequency for inbound and one for outbound. These signals may be picked up by both telephones and a signal-strength-indicating device, as for example a sensitive ammeter or galvanometer in a circuit resonant to the frequency of the current impressed on the guide conductor. With two or more such indicating devices the relative strength of the fields of the inbound and outbound signals and the relative strength of fore and aft and athwartship fields may be ascertained. Also by controlling the strength of the signal in accordance with the distance from a given point, for example, by grounding a portion of the current through suitable resistances at points fixed distances from the source of supply; the strength of signal would be relative to the distance from that source. Such indications of strength of signal relative to the source of supply (e.g. the

dock) and relative to the inbound and outbound signal conductors and relative to the angle the ship makes with the signal conductor, offer the means for a comparatively high degree of accuracy in steering the vessel clear from danger.

A further complexity of circuits may be provided which will afford sufficient accuracy in certain



By the use of this electrical cable laid along the navigable channel, the ship would be independent of pilots, and could enter a dangerous harbor in the thickest fog, or on very dark nights, without any previous knowledge of the locality.

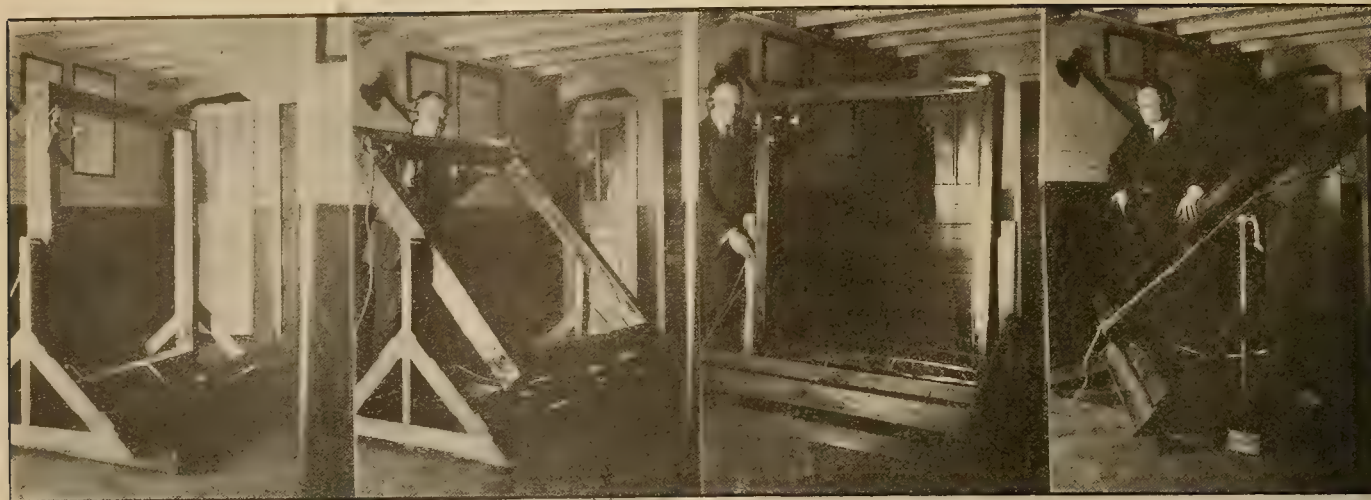
places, for example, the guide may consist of several conductors in one cable, the conductors being of several suitable lengths and suitable speech currents being impressed on them. For example, one conductor could carry a speech current which says periodically "One mile in" while the next in length would say "Two miles in," while the outbound signal wire in that vicinity might say "Nine miles out." The ships receiving circuits may be arranged fore and aft and athwartship in such manner as to indicate whether the ship is approaching the signal conductor or leaving it or is parallel to it or at some angle to it.

## Special Considerations

Structural conditions of ships, channel conditions, financial and political conditions have their bearings on what structural arrangements would be best to carry out the method. For example, in New York harbor it would probably be entirely practicable to provide all possible refinements and strong accurate signals which could be followed by vessels equipped with the more simple inexpensive apparatus and those which might be equipped with more expensive and more highly accurate apparatus.

In the long passages in Alaska it may be practicable and sufficient for the present to follow the army cable lines. This may be made possible by picking up the telegraph signals and guide signals which might be supplied by the army in intervals between telegraph signals. To do this is more diffi-





The receiving coil is supported on pivots and can be turned around a vertical axis or tipped around a horizontal axis. The loudest sound is heard when the coil is parallel to the cable and entirely on the same plane. The least or no sound is obtained when the coil is at right angles to that position. In the first of these views, taken looking aft, the ship is proceeding directly along the cable; in the second the cable is on the port side; in the third the ship is crossing the cable, and in the fourth the cable is on the starboard bow.

cult than would be the case if the cable was made for directing purposes, because the army cable currents are weak and the cable is covered with a sheath containing iron. Also the resistance inductance and capacity of the long cables limit the quantity and kind of signals that may be impressed on them.

However, there are several ways which can be used as may be necessary to pick up the weak cable signals although they are in an iron sheath. For example, the pick up current (which can be relatively small) may be lowered from the ship to near the bottom and maintained in the same relative position to the ship; also prescribed frequencies may be used on the cable and tuned receiver circuits and very weak currents may be amplified. The receiving or pick up circuit may include a coil virtually wound around more or less of the hull; one coil, for example, wound in a fore and aft plane, and another in athwartship plane, or a coil or coils inside or above the hull depending on practicability. Increasing the efficiency of the pick up coil, increasing the current in the signal wire, and increasing the amplifiers all serve to increase the possible distance.

#### Using the Radio Outfit

The signal current in the conductor along the channel may be like that in the antenna of a radio transmitter, and the radio receiving outfit on shipboard may be used to receive it, employing a regular antenna or a coil. Also the coil might be revolvable on its axis so it could be turned to pick up the signal and then turn the boat to the proper fore and aft position relative to the coil, and therefore headed right in the channel.

At this date it is pretty hard to say what is the most practical arrangement to use to suit conditions. It may be best to go along the lines of making the best direction control apparatus irrespective of the radio apparatus and leave the radio apparatus free to handle other things, or it may be best to impress common radio frequencies on the signal conductor or load the antenna for lower frequency so that all vessels equipped with radio could tell when they were closest to the conductor by the strength

of the received signal. The Alaska cable is probably not suitable for use with radio frequencies.

Also the use of the common radio frequencies in the guide conductor might interfere with some stations which did not want to receive direction signals but did want to receive messages from some station, and it is easier to build under water conductors for longer wave lengths.

Fifteen thousand meters is about as long a wave length as any kind of a radio station receives at present. Therefore, we might go to a little longer wave length, to which a ship's antenna could be loaded up, and for which a closed coil could be built, and which would be revolvable for getting the direction not only of this conductor but of radio stations. All of which could be received on detectors if interrupted properly.

All things considered, possibly the most practical form for common service would include a standard frequency for all ocean going vessels and for all ports, of say 750 cycles and enough current in the signal circuit to the receiving circuit would not necessarily include anything but a revolvable coil on top of the pilot house, a fixed condenser and a pair of phones with an indicating dial and coil-turning handle in the pilot house.

Such a frequency is applicable to quite long wires, and quite long wires might be required in some places. Also such a sinusoidal frequency and current can be fairly easily obtained from a dynamo and maintained with very small percentage variation. And such a receiving coil and condenser and phones can be fairly easily maintained comparatively constant.

Sinusoidal current and the frequency of 750 or 1500 would serve to cut out some interference. Those frequencies being different from the commercial 60 cycles, radio generator 500 and 1000 cycle frequencies, and seem to be sufficiently different from common motor and dynamo commutator and field frequencies. The average ear is probably most sensitive to about 750 cycles, but quite sensitive to 1500 cycles.

Special vessels (e.g. ferries) which do not use regular channels probably should be provided with



additional special frequencies. On the Alaska cable route special very low frequencies, perhaps twenty cycles or less, would be more practical. It might be found that the longest Alaska cable run has a minimum impedance for a frequency of four cycles or less.

There seems to be sufficient applicable forms, modifications, and combinations to provide a standard arrangement for each group wherein the service and service conditions have a sufficient number of common characteristics.

### Results in an Experiment

In a recent experiment a 4000 c.m. rubber covered wire about 700 feet long was dropped over and along the side of a dock into the water. The one end of the wire was bare and in the water, the other end was brought up on the dock and connected to one side of the "break" on a buzzer. The other side of the "break" was connected to the water. Five dry cells were used to operate the buzzer. The wire along the dock under water and the ground return showed a bridge resistance of about 5000 ohms.

The predominant frequency produced by the buzzer corresponded to about 1200 cycles. The rubber covered wire in the water was intended to correspond to a short guide conductor in a channel, the center of the channel being along the dock.

The receiving device consisted of a wooden frame four feet square wound with two coils of No. 28 D.S.C. wire. The coils were side by side separated by about 4 inches, each coil having a winding space cross section of about  $\frac{1}{2}$ -inch diameter. The coils were connected in series and had a resistance of about 1000 ohms and inductance with phones of about 10 henries. There were about 1000 turns. A variable air condenser of .005 max. capacity and a pair of 2200 ohms phones were connected in series with the total coil.

Wearing the phones and carrying the condenser and coil the length of the dock with the coil vertical to the dock and its lower 4 feet side parallel to the signal conductor, it was possible easily to hear the buzzer signals above the noise from riveters near the dock, the wind, induction from commutated circuits, etc.

## Measuring the Temperature of Molten Steel

BY F. W. BROOKE

(One of the most recently developed applications of electricity to industrial purposes is in steel-making, the electric furnace having been brought to a high state of efficiency. The following paper on the handling of molten steel, which was presented before the American Foundrymen's Association, is here reproduced as being of interest to the electrical industry. The author is a member of the Electric Furnace Construction Company, Philadelphia.—The Editor.)

A large number of trials and experiments have been carried out by steelmakers along with the very commendable support of the makers of pyrometers to try and put the measurement of molten steel upon a scientific and fairly reliable basis. Most of the practical investigators have known all along that the measurement of actual temperatures to any degree of accuracy is at present too much to aim for, and have contented themselves with the effort of finding some indication such as a reading on an instrument which tells them when the steel is at the best temperature to produce either a certain type of casting or a first-class ingot with the particular composition of steel they are handling, and that each time this reading is obtained the steel is at its best pouring temperature. In other words comparative tests have been their chief aim.

### Use of Pyrometers

Of the scientific instrument methods, we may consider thermo-couples, radiation pyrometers and optical pyrometers. The thermo-couple for temperatures of heat-treatment has proved valuable. In the measurement of molten steel, however, only the rare metal couples can be considered, and even these do not withstand the very severe conditions of a bath of molten steel. Protective tubes, such as quartz tubes, have been tried, but have certain disadvantages. The mechanical strength of a long tube at the high temperature is inadequate; the chemical reaction of the slag in the case of basic operation is undesirable; and the varying thickness of the coating of slag to the tube as it is pushed

through the slag causes a varying lag of temperature from the steel to the couple.

The radiation pyrometers, of which the Thwing or the Foster type of fixed focus pyrometer appear to be most satisfactory, require no focusing and the method of handling them is simple. Both of these instruments also have an attachment for taking care of the change in black body conditions from true black body conditions when steel is poured from a furnace or from a ladle. The accuracies of these attachments are not so important, as they are the same for each heat as long as the steel is in a completely molten state. The first obvious objection is that owing to the slag covering in the furnace, and the difficulty and objection of maintaining an uncovered patch, the temperature cannot be read until the steel is being poured into the ladle. While this only allows for correction of temperature in one direction, it still has several valuable advantages. If the temperature of the steel is too low, preference can be given to the heavy castings of large section and the pouring operation carried out as rapidly as possible. If the temperature is on the high side, the steel can be left in the ladle or preference given to all the small castings requiring a relatively higher temperature, but perhaps the greatest value is a check and guidance for the melter and the foundry superintendent on the now existing more or less crude practical methods to be explained later. In the open-hearth furnace, when consecutive heats are being run to the same analysis and same conditions, a certain difference of temperature between steel and slag may be assumed, but this is not very reliable.



The principal objection, however, in the use of radiation pyrometers is the difficulty of always being able to focus through a clear atmosphere and onto a clean stream of steel. In actual practice, it is found that smoky atmospheres and incandescent gases are constantly interfering, while in many furnaces the slag comes out of the teeming spout along with the steel and it is very difficult to know which of the readings recorded represent true conditions, or the same conditions as on the previous heat. There is also a tendency on the part of the observer to record the highest reading on the instrument and interference of a small amount of incandescent gas can escape notice. The following readings are typical of many tests made of a stream of steel leaving the nozzle of the ladle when pouring castings of easy section of about 30 to 100 pounds in weight and 0.25 to 0.35 per cent carbon, by the same instrument and the same observer, the resulting castings being of first-class quality.

Heat No. 7			Heat No. 23		
Mold	Degrees Cent.	Degrees Fahr.	Mold	Degrees Cent.	Degrees Fahr.
1	1510	2750	1	1530	2790
2	1560	2840	2	1540	2800
3	1515	2760	3	1210	2210
4	1740	3170	4	1560	2840
5	1530	2790	5	1490	2710
6	1580	2870			

It is obvious that the readings on the fourth mold of heat No. 7 and the third of heat No. 23 were decidedly off, although every care was taken on both these heats to get uniform conditions, and the error is undoubtedly due to incandescent gases and smoky atmosphere. Results both better and worse were obtained, and these are given as typical when every care was taken.

Practically the same limitations are noticed with optical pyrometers as with the fixed focus radiation type, the added disadvantage being that with every type of optical instrument there is more of the personal element brought in by the matching of intensities or the matching of colors. On the other hand, they are not so liable to damage by the too close proximity to the molten metal, as an observer has less fear of sticking a long tube up to the stream than of bringing his face too near.

Of the practical methods known, the film, rod and pouring tests are in constant use at various electric furnace plants, and they are all depending upon uniform conditions existing when each test is made. The use of the film test originated from the crucible steel practice, it being the best practice in making tool steels to first close all the melting shop doors; then to pull the pots after the required stewing and remove the lid and slag; make any additions and then carefully watch the bright surface of the steel for the first sign of an oxide film forming, this being the sign to commence pouring operations. In the absence of drafts, this served as a fairly reliable temperature indicator, as the crucibles and the mass of steel were usually the same, while the varying composition of the steel could be allowed for by pouring as soon as the first speck appeared, or so many seconds later. In electric furnace practice, this consists of using a steel spoon of uniform ca-

capacity, dried out thoroughly over the bath, and giving this a total covering of slag in the furnace. A sample of steel should then be taken, which fairly represents the whole bath, remembering that when a door has been left open for some time the steel near the door has become chilled, and with steel made in an electric furnace where all the heat is applied at the top only, the temperature of the steel directly under the slag is higher than the temperature of the steel near the bottom. Where this is the case, the bath must be thoroughly rabbled before any sample is withdrawn, and even then the sample should be taken at a place equidistant between the electrodes and half way down the bath, so as to arrive at an average temperature. The measurement of the temperature is then indicated by the length of time it takes for an oxide film to completely cover the sample after the sample is taken from the bath. This method is also influenced by the composition and physical condition of the bath, as for molten steels of the same temperature this time varies, principally with the carbon contents, the silicon contents, other alloy contents and the state of deoxidization. Therefore, final comparisons must only be made between steels of approximately the same composition and when the furnace is ready to pour. Care must be taken to keep the sample away from drafts and to have about the same amount of steel in the spoon each time. To show the range of this test it has been noted that first-class high-speed steel ingots of a composition approximating carbon, 0.65; tungsten, 17.5; chromium, 3.75, and vanadium, 1 per cent, were produced when the film (with a later characteristic wrinkling of the surface) was formed directly the sample spoon came through the door, while good castings of about 0.25 carbon and weighing from 30 to 200 pounds were produced when the film took 60 seconds to form after passing the furnace door.

#### Factors Affecting Use of Rod Test

The rod test has been used for many years as a rough indication of the temperature of many molten metals. The first publication noted by the author of this test being made a standard practice under uniform conditions was from a large Italian steel works. This test requires the use of rods of steel of both uniform diameter and fairly uniform composition, and consist of plunging the rod into the bath of steel and gently moving it through the bath for a uniform length of time. If the steel is cold there is a deposit of the bath on the rod; if the steel is hot the bath melts away or bites into some of the rod, with all intermediate conditions indicating varying temperatures. The skin of the bar, it will be noted, has an effect on this test; a newly rolled bar with a bright scaly surface tends to show a colder bath than is actually the case. The bar before being plunged into the bath should be of uniform temperature and in some steel works this is taken care of by bending about 12 inches or more of the end of the bar at right angles; holding the bar with the bend in a horizontal plane over the bath until it shows the first sign of sagging and then turning the end



of the bar into the bath. This test again depends on the physical condition and the composition of the bath. This test is also very useful for testing the difference in temperature between the top of the bath and the bottom of the bath and is one of the best indications of the value in electric furnaces of the bottom heating type. Several tests were carried out on a furnace of the Graves-Etchells type and not a single test showed any indication of marked difference in temperature between the top and the bottom of the bath and in every case it was shown that in a furnace of this type there is no need for any mechanical stirring of the bath. Considering the crudeness of this test and the fact that the rod had to be passed through a slag, the uniform effect of the bath on the bars was quite remarkable, both for baths that were relatively cold and hot.

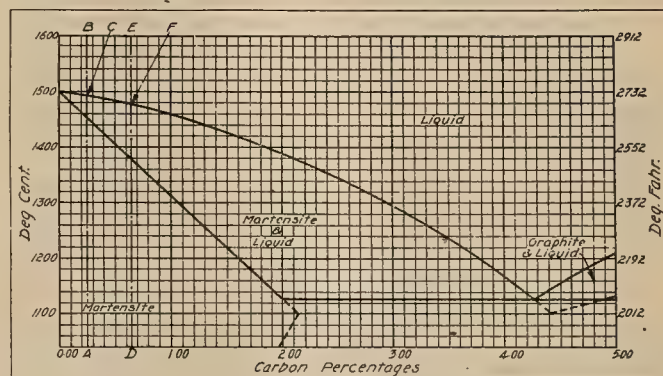
### Temperature is Indicated by Fluidity of Metal

The pouring test consists of using a spherical spoon of above 5 inches in diameter and carefully slagging up this spoon over the bath. Dip the spoon quickly into the metal so as to get a sample of the steel from about the center of the bath. Withdraw the sample and carefully pour out the steel over the lip of the spoon at a slow even rate. The temperature of the steel is noted by its fluidity, and by the amount of steel skull that is left on the spoon. This test is the one most commonly used in steel foundries. It is simple and the very nature of the test gives confidence to the man who is responsible for pouring the heat. If he sees every drop of the steel pouring nicely over the lip, he feels that in pouring from the ladle itself the castings of small section will fill up and there will be no skulls left in the ladle. This test is subject to the spoon being properly slagged up, the rate of pouring the sample, and absence of drafts.

For all these practical methods too much emphasis cannot be placed upon the fact that they are all comparative tests only, and that they depend entirely upon uniform conditions, and attention to details. In all cases at least two of these methods should be employed. They do not of course indicate to the melter the temperature of the steel in degrees, Cent. or Fahr., but they do give him a very good indication of the degrees of temperature that the steel is either above or below the temperatures which will give him the best results for the composition of the steel he is handling, for the weight and for the type of casting he is making. In making steel castings it is important that the foundry foreman or superintendent be present when the final temperature tests are being made. He is in a much better position to know how hot the steel must be to suit the castings on the floor. To tell the melter that castings are averaging 30 pounds and then to leave decisions regarding temperature to him, is insufficient.

The question most frequently asked while trying out the above tests was: "How accurately can you measure the temperature of the steel and what temperature should the steel be when it leaves the furnace to give the best results?" The first part of the question refers to the use of pyrometers. On steel works where the best conditions for the pyro-

meter can be obtained, there is still the limitations of the pyrometers themselves. As already explained, only the optical and the radiation type offer a good field for these high temperatures and conditions, and there is little doubt that an error of plus and minus 50 degrees Fahr. in the instrument itself is all that we can ever expect. To an investigator first



STANDARD CARBON-IRON CURVE

starting in with a new instrument he has just bought, this may not sound very encouraging as he naturally feels that if the steel proves to be 50 to 100 degrees Fahr. less than what he is aiming for he will spoil some of his castings.

### Determining Best Temperatures

Probably the best reply to the second part of the question is that the temperature in question is that at which the particular steel begins to solidify, plus the loss of temperature from when the reading is taken to when the steel gets to the farthest end of the thinnest section in the casting. A further query to this second part of the question invariably was: "But how are we to know what these two values are?" The first value depends on the composition of the steel, the carbon contents being the principal factor. This can be obtained by reference to a standard carbon-iron curve, such as shown in the accompanying illustration. For a steel containing 0.25 per cent carbon, trace the line A B till it intersects at C giving a value on this curve of 1492 degrees Cent. (2720 degrees Fahr.); for a steel containing 0.65 per cent carbon, trace the line DE till it intersects at F, giving a value 1476 degrees Cent. (2690 degrees Fahr.), and so on. For other elements in the steel commonly used in castings the variation is not of importance and does not compare with the many other sources of error that crop up in reading the temperatures of molten steel in a foundry. The second value depends upon such variables as the heat of the ladle, the thickness of ladle lining, time of reading to pouring, whether molds are of dry or green sand, and thickness and lengths of the thinnest sections. All of these factors depend very much upon local conditions, and it is regarding this problem that constant consultation between the man responsible for the steel in furnace and the man responsible for making up the molds is so valuable. Final results are only obtained by the constant comparison of the quality of the final castings with the results obtained by their methods of reading the temperatures of the steel.



# Revising the Gravitational Constant

BY DR. A. C. CREHORE

(In this discussion the author, one of our best known authorities as a physicist, shows how this new theory may upset the hitherto given values of the gravitational constant involved in applying Newton's great law of gravitation. Further comment on this interesting discussion may be found on the editorial page of this issue. This article is the sixth in a series appearing in the Journal of Electricity by this noted author, on the subject of The New Physics. —The Editor.)

Applying the gravitational force above given for a single pair of electrons to a large multitude of electrons such as must exist in any mass of matter, it becomes evident that the only quantities that change in the expression for the force, as one pair after another is included, are the speeds of the electrons,  $\beta_1$  and  $\beta_2$ . Evidently, therefore, the whole attraction between two bodies of gross matter is expressed by summing up the  $\beta^2$  over each body, the other quantities coming out as common factors in taking the sums. We have then, as representing the whole attraction between two gross bodies of matter, the equation,

$$F = \frac{1}{3} m_0 e^2 \sum_1 \beta^2 \sum_2 \beta^2 r^{-2},$$

where  $r$  now represents the distance between their centers of gravity.

## Speeds of Electrons

It is not possible to proceed further to get a numerical value of the force expressed by this equation until something is known about the values of the speeds of the electrons in the atoms. In order to arrive at a numerical value of these speeds let us now anticipate some of the results that come from the theory of the atom described in a later section.

If an electron revolves in a circular orbit with a frequency,  $n$ , it describes  $n$  circumferences in one second of time, that is, it travels a distance  $2\pi an$  in one second, which, therefore, represents its absolute velocity,  $v$ . The theory of the atom, to which we are coming later, says that the frequency of revolution of the two electrons in the hydrogen atom is equal to twice the Rydberg constant,  $2K$ . Hence their velocity must be

$$v = 4\pi a K, \text{ cm. per sec.}$$

And, again, the theory makes the kinetic energy of the two electrons together in the hydrogen atom equal to the product of Planck's constant and Rydberg's constant,  $h K$ . Hence,

$$m_0 v^2 = h K.$$

But we have already obtained a value for Rydberg's constant, namely

$$2 K = m_H \left( \frac{c}{e} \right)^2,$$

and from these, by eliminating the  $K$ , we obtain

$$v^2 = \frac{h m_H}{2 m_0} \left( \frac{c}{e} \right)^2 = \beta^2 c^2.$$

Hence

$$\beta^2 = \frac{h m_H}{2 e^2 m_0},$$

and

$$\beta = \frac{\sqrt{2}}{2e} \left( \frac{h m_H}{m_0} \right)^{1/2}.$$

The above gives the speed of an electron in the hydrogen atom in terms of known constants. There are two electrons in a ring in this atom, and there is good reason to believe that the formula for the speed of any ring of  $p$  electrons may be obtained by putting  $p$  in the place of the 2 in the numerator above, thus giving the general expression for the speed of the electrons in any ring as

$$\beta = \frac{\sqrt{p}}{2e} \left( \frac{h m_H}{m_0} \right)^{1/2}.$$

Squaring this expression, and then multiplying the result by the number of electrons in the ring, the sum of the squares of the speeds of all the electrons in the ring is obtained. In the case of the hydrogen atom, where  $p=2$ , this sum is

$$\sum_H \beta^2 = \frac{h m_H}{e^2 m_0}.$$

When dealing with a single atom of hydrogen alone, having but this one single ring of electrons, this last expression represents completely the value of  $\sum \beta^2$  required in the gravitational formula above given. Let us, therefore, write down according to these ideas the gravitational force on the average between just two hydrogen atoms at a great distance from each other. Since the two atoms are alike, the product of  $\sum_1 \beta^2$  and  $\sum_2 \beta^2$  is merely the square of the above value, and we evidently obtain as an expression for the whole force

$$F = \frac{1}{3} \frac{h^2 m_H^2}{e^2 m_0} r^{-2}.$$

The values of these constants are known, and hence the magnitude of the force may be calculated. But, if it is the same as the average gravitational attraction according to Newton's law, it must agree in magnitude with the following:

$$F = k' m_H^2 r^{-2}.$$

This is the force expressed by Newton's law on the average between two hydrogen atoms, where  $k'$  denotes the well known gravitational constant. Equating these two expressions for the same force, the  $m_H^2$  and the  $r^{-2}$  cancel, and the gravitational constant,  $k'$ , becomes

$$k' = \frac{h^2}{3 e^2 m_0}.$$

The dimensions of this expression are correct, for by Newton's law  $k' = F r^2 / m_H^2 = L^3 M^{-1} T^{-2}$  on the common system, or  $L^2 T^{-1}$  on the space-time system. By using the dimensions on the space-time



system given in Table I for the quantities on the right of the equation, it will be found that they are the same as the dimensions of  $k'$  just obtained.

#### Numerical Value of the Gravitational Constant

The numerical agreement between the experimental value of  $k'$  and the numerical value obtained by substituting the best values we possess for  $h$ ,  $e$  and  $m_0$ , is not as close as the agreement heretofore obtained between the theoretical values and the experimental values above in the cases of  $e$ ,  $h$ ,  $m_H$  and  $m_0$ . The value of  $k'$  obtained experimentally is about  $666 \times 10^{-10}$ , and the value of the right hand member above is  $703.69 \times 10^{-10}$  when we take  $h = 6.558 \times 10^{-27}$ ,  $e = 4.763 \times 10^{-10}$ , and  $m_0 = .898 \times 10^{-27}$ .

There are many difficulties presented in obtain-

ing an accurate experimental value of the gravitational constant on the centimeter, gram, second system. Astronomers usually take the mass of the earth as unity in all astronomical problems, and the work of the astronomers alone is not sufficient to give a numerical value for  $k'$ . These measurements really come within the province of the physicist. The evidence for a greater value of  $k'$  is so strong in the author's opinion that it is his belief that some day it will be possible to find where the present methods used for obtaining its numerical value require revision. The present value needs to be increased by about 5% to bring it into exact agreement with the theory. There is more confidence in the experimental numerical values of the other constants involved than there is in this one.

## Great New Irrigation and Power Developments

BY CHARLES H. LEE

(Phenomenal increase in the applications for unappropriated waters in California is shown by the statistics herein presented by the executive member of the State Water Commission of California. They show that in the past six months applications have been filed contemplating active development of 26% of the maximum ultimate hydroelectric power resources of the State. —The Editor.)

The State Water Commission of California has recently compiled data which shows in a striking manner the resumption of activity in agricultural and hydroelectric power development during the past year. Not only does this data indicate a return of normal activities, but it shows in addition an increase of nearly 40 per cent over the average for the past five-years. California is launching upon a period of unprecedented development.

The State Water Commission has supervision over the use of unappropriated waters of California. These waters were declared to be public property un-

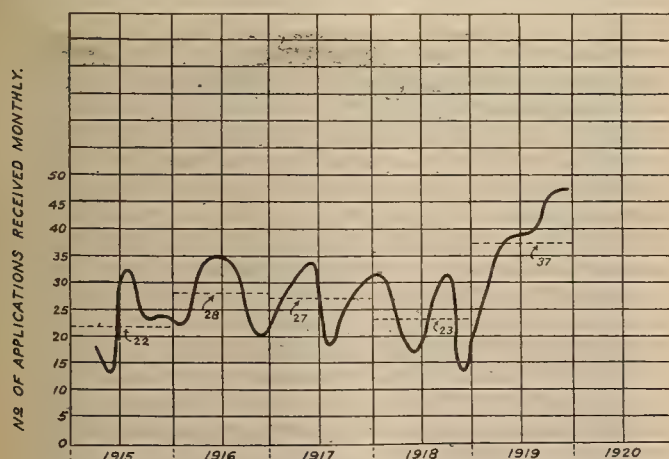


Chart showing the remarkable increase during 1919 of applications for water-appropriation in the state of California.

der the Water Commission Act which went into effect on December 19, 1914. Under this act, applications must be filed with the commission for permit to use unappropriated water. The principal applications received are for irrigation and generation of hydroelectric power, but the demand for mining and municipal uses is also considerable. During six months ending December 31, 1919, 62 per cent of the applications received were for agricultural, 30 per cent for power, 6 per cent for mining, and 2 per cent for municipal uses.

The relative number of applications received by the commission is a reliable index of the general business and financial condition throughout the State. The data for the period since the commission was organized in 1915, has been made available in the form of a diagram showing the number of applications for permits which have been received monthly. The outstanding facts shown by this diagram are the influence of the war, and the resulting high prices, upon agricultural, power and mining development in the State. Prior to the active participation of the United States, there was a normal increase from year to year, with a periodic summer peak. In 1917 the peak did not reach its anticipated climax, but fell off rapidly immediately after the declaration of war in April. The efforts to stimulate food production resulted in a partial recovery late in 1917 which reached its climax early in 1918. The average for the year 1918, however, was 18 per cent less than in 1916, and 15 per cent less than in 1917. The month of the armistice, November 1918, produced a sharp decline with a minimum below that of any previous month in the history of the commission. The subsequent recovery has been rapid, the rise continuing steadily to December, 1919. The number of applications received during December, 1919, was 33 per cent greater than in any previous month, and for the year was 37 per cent greater than the average for the past five years. This unprecedented activity is the result of the prevailing high prices for agricultural products and the more intensive cultivation of the soil by means of irrigation.

#### Agricultural Development —

The applications are for widely varying amounts of water and for the irrigation of from a few acres by homesteaders in the hills to several hundred thousand acres by irrigation districts in the San Joaquin Valley. The extent of the immediately proposed agricultural development in the State is indicated by the fact that the total area of land for the irriga-



tion of which applications have been filed during the six months ending December 31, 1919, is 2,140,000 acres. This area is 22 per cent of the total irrigable acreage of the State for which water is available, and is more than one-half of the present irrigated area. The lands applied for are principally in the great valley of Central California, and include the Merced, Madera, San Jose, proposed Kern Delta, and other large irrigation districts in the San Joaquin Valley, as well as rice lands in the Sacramento Valley.

#### Hydroelectric Projects —

Hydroelectric power development is fully as active as agricultural development. For the same six months period applications were received for permits to divert water to generate 2,103,000 theoretical horsepower, largely on streams tributary to the San Joaquin Valley. This quantity is 26 per cent of the maximum ultimate power development of the State as stated in the report of the U. S. Commissioner of Corporations in 1912. The largest proposed installations are those of the Southern California Edison Company on the San Joaquin River, totaling more than 1,000,000 theoretical horsepower at nine power plants, two of which are already in operation. Others are the San Joaquin Light & Power Corporation plant on San Joaquin River, with 33,000 horsepower; the Modesto and Turlock Irrigation District plant on Tuolumne River, with 45,000 horsepower; and the Mokelumne River Power & Water Company on South Fork Mokelumne River, with 32,250 horsepower.

#### Necessity for Storage —

This phenomenal increase in the use of the waters of the State brings forcefully to attention the absolute necessity of the storage of surplus waters for use during the periods of shortage. This is necessary not only for irrigation but for power development, and most of the applications filed with the commission include storage of greater or lesser amounts. The acuteness of the situation is indicated by the fact that even in the Sacramento Valley, during the late summer, a shortage is imminent in the flow of the Sacramento River. The normal flow of the river is being appreciably reduced each year by the increasing amounts used for the irrigation of rice. If this industry continues to expand as it has during the past four years, storage must be provided. There is strong probability during the coming season, not only that the river will be largely diverted but that a considerable acreage will be without water during the latter part of the growing-season, unless a limit is placed upon the acreage planted.

The difficulties of financing large storage projects, and the diverse interests depending upon the use of storage water, both point to the desirability of the construction and operation of large reservoirs by the public. The Federal Government is not prepared to undertake storage projects on a broad scale in California principally because of lack of funds. The logical procedure is for the State to undertake such enterprises.

### ANNOUNCEMENT

#### MORE LIGHT — BETTER WIRING

- in the home
- in the school
- in the street
- in the show window

#### GOOD LIGHTING PAYS

The next issue of the Journal of Electricity will include a comprehensive paper by F. D. Fagan of the Edison Lamp Works, dealing with the value of proper illumination in all departments of human activity.

To foster the use of

#### ELECTRICAL APPLIANCES IN EVERY HOME

cooperation between builder, architect, contractor and publicity man must bring about the proper wiring of houses. Six great factors in promoting adequate employment of baseboard receptacles will be introduced in an authoritative paper by Garnett Young of the Garnett Young Company in the next issue of the Journal of Electricity.

These two papers are the first advance material from the

1920 N. E. L. A. CONVENTION

## Western Ideas

FEATURE ILLUMINATION which is effective in result and which requires no extensive and expensive installation is often a desirable adjunct for a celebration of which electrical illumination is a feature. The Griffith-McKenzie Building of Fresno, California, developed an interesting such arrangement during war times, which is susceptible of modification to meet particular conditions. As can be seen from the photograph, this is obtained merely by the illumination of certain specified windows to form a design against a dark background of the re-

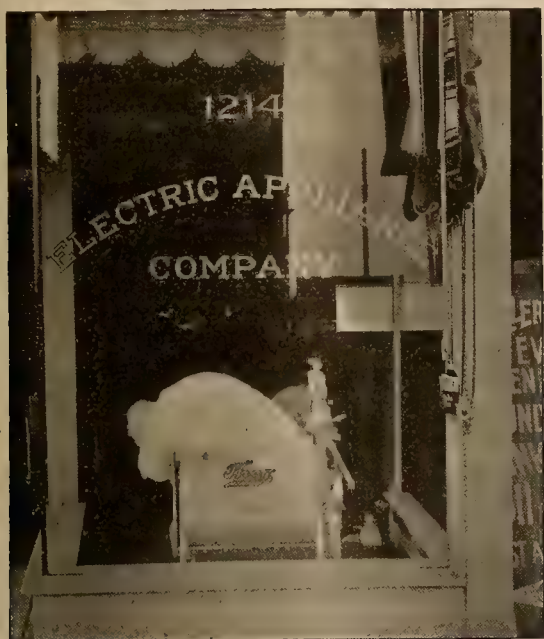


A design in lighted windows



mainder of the building. In this case it is the large block letters "U. S." It is obvious, however, that any purely conventional design can be carried out with a little ingenuity. With a very trifling expense, colored effects may be obtained by the temporary substitution of colored lamps or colored shields for the desired windows. The opportunity for lamp sales and the encouragement of a growing use of electric illumination is a field which should not be overlooked by the contractor-dealer.

AN INTERESTING WINDOW DISPLAY used by the Electric Appliance Company of Seattle is a single Thor Washer containing suds that will pile up eighteen inches or more, made with borax soap and



Colored lights are played on the moving soap suds, and the effect is one which attracts constant attention

a little hot water. The effect of this billowy mass of moving suds attracts a great deal of attention.

To make the display still more striking, a many-colored revolving screen is mounted on the ceiling of the window, and a high-powered auto searchlight placed behind it. This throws a changing colored light on to the soap and gives the effect of lights inside the washer.

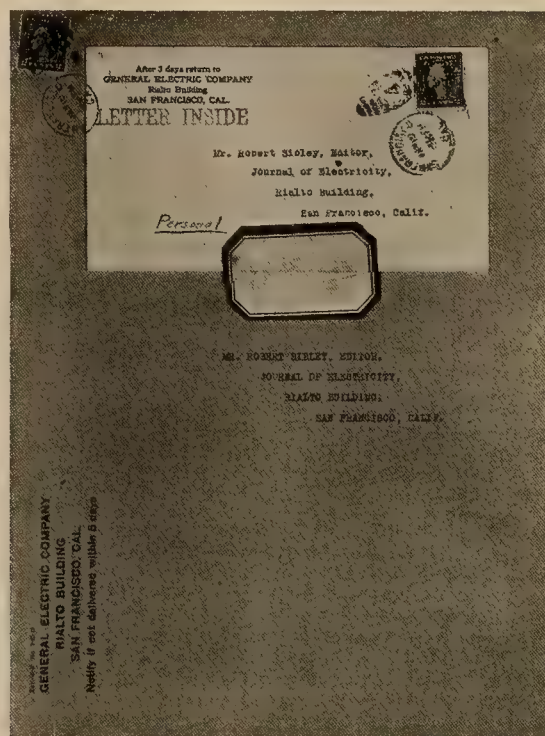
One framed advertising card, 12 x 22 in., hangs in the window, bearing the following inscription:

—This is Mrs. Thor  
She works for ½ cent an hour  
Eats no lunch  
Washes Clean

COMBINATION ENVELOPES can be a great boon both to sender and recipient. It is usually desirable that the reader of a letter should have before him the bulletin or catalogue to which reference is made in the letter. If the bulletin comes along later in another mail, much of its effectiveness is lost.

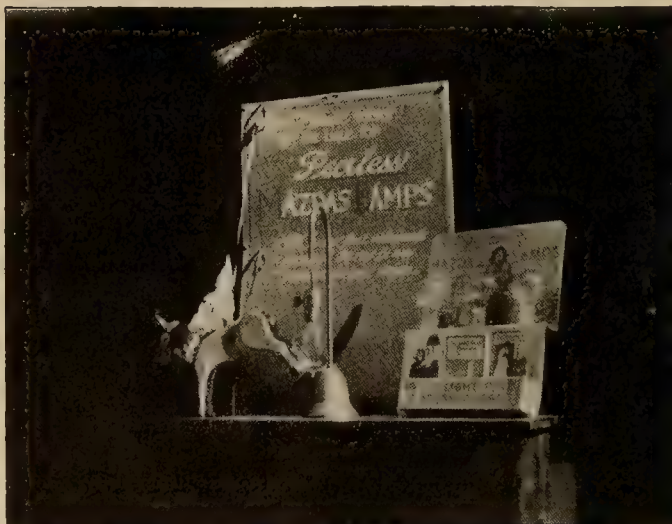
The General Electric Company in San Francisco has been accomplishing this purpose by the use of a combination envelope which is merely an ordinary business size envelope pasted onto a larger bulletin size envelope. Both envelopes must be addressed and the proper postage separately

affixed. This will insure separate delivery in proper shape should the two envelopes become detached in the mails.



A simple combination-envelope device which can be employed by anyone without the purchase of specially manufactured stock

This plan meets with the approval of the postal authorities. First class postage is required on the letter envelope and third or fourth class postage (according to weight) on the bulletin envelope.



Knocking machine used by the Electric Appliance Shop of Los Angeles

KNOCKING is a more or less dangerous and unpopular pastimes these days, but there are still a few who may do it with impunity, among them "Maude," shown in the accompanying picture contributed by the Electric Appliance Shop of Los Angeles. This ingenious knocking machine is not merely a proof of the durability of the lamps which Maude maltreats from dawn to dewy eve, but is a display which arrests the attention of every passing child, grown-up or otherwise, and makes the store a landmark on its street.





## The Spirit of Progress

BY S. M. KENNEDY

(To every branch of practical human progress—transportation, communication, home-building—electricity has brought an incalculable contribution. The general agent of the Southern California Edison Company here reviews some of man's most notable achievements in the advance of civilization, and the part played by electricity in their development. This is the seventh article of the series.—The Editor.)

In these latter days, the word "progressive" is dinned into our ears to such an extent that some people are liable to misunderstand its meaning or become absolutely tired of it. However, we of the electrical fraternity know that as progress leads to perfection, the progressive spirit is something to be cultivated by all connected with the great industry of which we are a part. If we are to progress we must be active. We must neither mark time nor stand still, for if we are not moving forward, we are slipping behind. Perhaps the American people comprise the most progressive nation in the world, and the most restless and inventive American is the Yankee. No less an authority than Chauncey M. Depew has stated his belief that the great inventiveness of this same Yankee is due to his fondness for pie. Pie twice or thrice a day will eventually produce indigestion in the strongest stomach, and with indigestion a man cannot sit still and remain peacefully contented. He must have action, mental and physical, and action will invariably produce results.

### Land Transportation

Let us glance at the results of the progressive spirit in businesses which might be considered as correlated to the one in which we are engaged—that is the electric industry. This refers particularly to transportation, the telegraph and the telephone. Transportation has, properly speaking, three divisions: land, water and air. Land transportation may be traced back to the period when mothers first strapped their babies on their backs. Since that time more patents have been issued upon inventions relating to transportation than upon any other line of human activity. They range all the way from a tiny device for unhitching a runaway horse to the latest idea in guiding an automobile. It is well to pause and consider what this wonderful development

in land transportation has meant for the civilized world; how the spirit of progress has linked country with country and nation with nation, so that together and with the aid of each other they might move forward to fulfill their destinies. Think how these many railways have prevented the close congestion of population in large cities by opening up the surrounding territories, and reducing the time from the suburbs to the center. Railroads have made the rough places smooth; have annihilated distances, and at times have almost rivaled the sun in their speed. Progress is now beginning to revolutionize railway travel. Instead of continuing with the wasteful use of coal or other fuel, many railroads are figuring on changing their motive power from steam to electric—in fact, there are some thousands of miles of railroads in America already converted. In addition to the more economical operation with electricity, there is an additional advantage—for electric power increases the capacity of a single track road anywhere from fifty to eighty per cent.

### Electricity on the Sea

Some of our fathers and grandfathers came from Europe in vessels which were conspicuously uncomfortable for passenger travel, as we now look back on them, but they were considered wonderful ships in those not so very far distant days. Should you now desire to go to Europe, you will observe what a marvelous change has been brought about by this same spirit of progress. You are ushered on board a great floating hotel, a structure so big that only giant waves have any material effect upon it, and so powerful that the energy it contains is measured by tens of thousands of horsepower. When you wish to move about on this castle there are servants at your beck and call for all purposes, and electricity is the servant of the servants. Little electric



railways operate in the bowels of the vessel, and electric elevators lift you from deck to deck at your pleasure. Your state room is warmed or cooled by electricity as well as scientifically illuminated with lights from invisible sources. Your meals are cooked by means of electric energy and carried from the kitchen to the dining room by the same force. In fair weather and foul, you may work or play, eat and sleep, be amply entertained or peacefully rested on board of one of these great modern steamships, and all the time you are being swiftly and comfortably carried to your destination. It has been the tireless spirit of progress, working on time and possibly overtime that has wrought this marvelous change.

### Invading the Air

But progress is still moving forward and we are now launched upon a new era of transportation which bids fair eventually to revolutionize other means of travel. Air travel had been well started before the great war began—but the experiences and necessities of the four years' struggle advanced air transportation twenty years ahead of what it would have been under peaceful development. Mail and passenger services in a limited sense are already in regular operation in many countries. A printed notice is posted in the office of one of the largest hotels in Chicago which reads, "The aerial mail for New York leaves here daily at 8:45 a. m." Such a notice is now read in a matter of fact manner by the hotel guests. More extensive trips, even trans-continental routes are now being planned for aerial travel—and before long trans-oceanic service for mail and passengers will be in effect over many seas. This new method of transportation will produce many changes in our methods of living. Possibly those of us who are "going up" will soon begin to discard surplus apparel, and even turn our pocket money into greenbacks, in order to cut down the weight. Those of us who stay down will probably require to carry as much accident insurance as those who fly, for we will never know what may strike us when we leave our homes. Only as far back as yesterday, all we had to look out for, when we ventured abroad, was the automobile, the bill collector, the trolley, the truck, the hansom cab, the taxi, the bicyclist, the switch engine, the gentleman who carried his umbrella under his arm with the ferrule pointing to a quarter past three, and the lady who walked one direction and looked another. That was all. But today, we not only have to look out for all those possibilities with our eyesight, but we have to keep part of it aimed at the sky above, for southbound aeronauts, whose little aeroplanes have failed to aero properly.

Without the inventions of two great men, rapidity and safety in railway traveling would have been impossible. These men were George Westinghouse, the inventor of the air-brake, and Professor Morse, the inventor of the practical method of telegraphy. Sometimes a big man fails to recognize the spirit of progress when it hunts him up. When Westinghouse was ready to exhibit a model of his air-brake, he sent a letter concerning it to Commodore Vander-

bilt, the then leading railroad man in the country. Vanderbilt smiled at the idea of stopping a train with wind, and wrote at the foot of Westinghouse's letter, "I have no time to waste on damn fools"—C. Vanderbilt. Later Westinghouse made a similar



The earliest form of transportation made use of by the human was the strength of his own muscles. Today the aeroplane brings distant cities close together and gives man the use of the great unobstructed spaces of the air.

request to President Cassett of the Pennsylvania Railroad. Cassett listened and gave Westinghouse a chance to demonstrate, with the result that the railroad world was startled. Vanderbilt heard of the experience and wrote to Westinghouse to call and explain the device. It is said Westinghouse returned the letter and across the bottom was written, "I have no time to waste on damn fools."—G. Westinghouse.

### Development of Telegraphy

A story is told of one of the early experiments in telegraphy. For this experiment twenty-six wires were required from one point to another and at each end of each wire was attached a pig—each pig representing a letter of the alphabet. The current sent over a wire caused one of the pigs to squeal, and the receiver of the message knew that squeal called for a certain letter. It would seem as if the progressive spirit has done some good work since that first experiment. By and by a code system was worked out and a message could then be sent one way at a time on a metallic circuit. Then someone stumbled onto the fact that if the ends of the wires were stuck in the ground, one wire would do as well as two—in other words, the grounded circuit was put into effect. Then new inventions were added to new inventions, and instead of one message one way on one line at one time, we have a multiplicity of messages each way on the same wire. That was progress in itself—enough for an ordinary century—but not enough for us. Marconi and others said, "Why all this waste of wires?" "Why all those forests of poles?" And lo, wireless telegraphy was born. Every man has his own opinion as to the marvels of the period he lives in—but no matter what else the



spirit of progress has developed during recent years, there can be no greater wonderment than the wireless message. To the uninitiated, it may seem reasonable that a sound or a flash can be transmitted over a wire—but to send and receive recognizable messages through unlimited, boundless space makes a staggering impression upon the ordinary man with average intellect.

Away back at the time when the telegraph and cable were the most wonderful things in the world, a young man was desperately busy in a noisy machine shop in Boston. He was wholly absorbed in what appeared to be an absurd looking toy. For three years he was toiling over it, and then on a hot June day in 1875 an almost inaudible sound—a faint twang—came from the machine itself. That twang of a spring was the first tiny cry of the new-born telephone, as feeble and helpless as any other baby and “with no language but a cry.” That young man was Alexander Graham Bell, and that baby of his, has grown until it is one of the greatest necessities of modern life. When it was patented, there was no name for it in the world’s languages, and its description called for “an improvement in telegraphy.” It is a pretty young child who would not know today that it is nothing of the kind. It is as different from the telegraph as the eloquence of the orator is from the language of the deaf-mute.

The progressive spirit is working. The wireless telegram has become an important servant in peace and in war. The wireless telephone is coming, and doubtless will be here upon a commercial basis in the not distant future. We may yet see the day when every man will be his own “central” and with a pocket telephone, he may be able to talk to whom he pleases at his own sweet will. The line then will never be busy, and the war tax on such messages will be hard to collect.

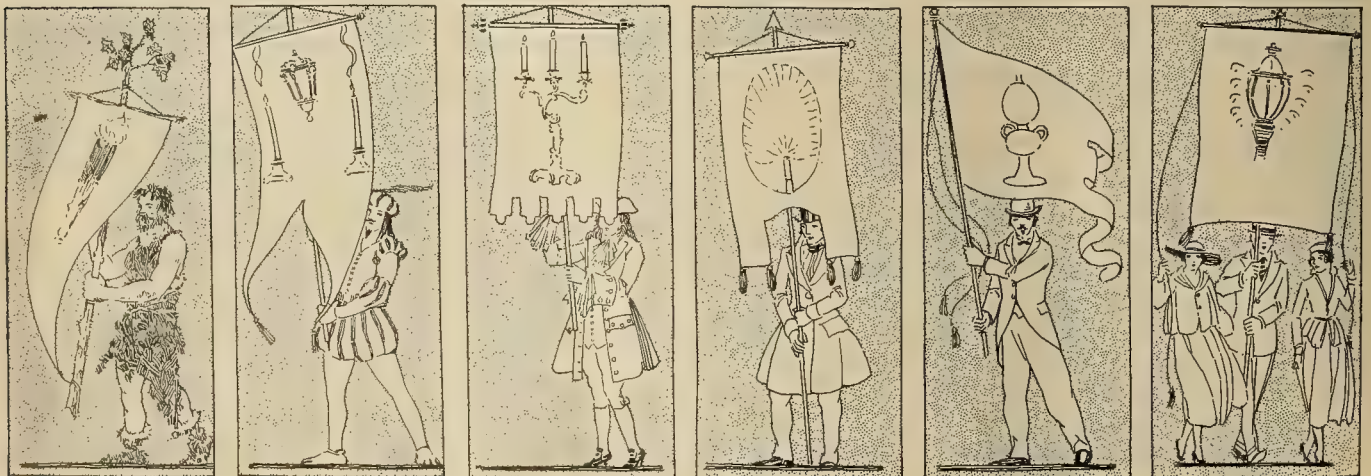
In front of the beautiful Union Railway station in Washington, D. C., there is this inscription:

“Electricity, carrier of Light and Power  
Devourer of Time and Space;  
Bearer of human speech over land and sea,  
Greatest servant of man—itself unknown.”

We are told that there is invested in the electrical business in the United States nearly four billions of dollars, and that this large investment has been piled up during the past thirty-five years. Thirty-five years ago, electric lighting was a marvel; today it is in nearly every home where the service is available. Almost every day sees some new application of electricity, which adds to our personal comfort, or to the easier or more economic transaction of business.

### More Light

The progressive spirit is perhaps more marked in lighting matters than in many of the every-day necessities we think are ours by right. Our original human ancestor, as far as history informs us, was the cave man. As his name indicates, this progenitor of ours lived in a cave—mostly because he did not know what else to do about a home. His activity was much along the same lines as other animals. He arose with sun and retired at sunset, and had no artificial light at his command. He lived on roots, berries and raw flesh. He did not have to hunt for a cook, because he had no fire and no food that needed preparation. After all, his life was not without some compensations. Then one day he accidentally struck a piece of flint and a spark arrived. From that spark our business started. The cave man was soon staying out at night, and his wife awaited his return with a pine torch to illuminate his cave and some meat stewing in a kettle over a fire. Then, by and by, grease commenced hanging around that kettle, which would drip into the fire, and somehow the successors to the cave man got this grease hitched into a rope and the tallow dip was born, with an illuminating capacity of one candle power. It took centuries to progress, and eventually we got the oil lamp—then artificial gas, and by that time it was thought all that was good in lighting had been discovered. The world sat back contented with its illumination until about thirty-five years ago—and then a crude method of electric lighting was made commercially possible. Altogether there have been issued by the authorities in Washington more than 58,000 patents on electrical subjects, a large percentage of which are in reference to lighting mat-



The evolution of lighting, from the pine torch of the cave man to the brilliant electric lamp of the twentieth century, has proceeded side by side with the development of civilization.



ters. The Department of Commerce and Labor is the authority for the statement that the United States uses more electrical energy than any three countries in the world, and is the most brilliantly lighted nation on the face of the earth. Between the Atlantic and the Pacific and the Gulf and the Great Lakes, there are in use over one hundred million incandescent lamps. If these millions of lamps could be concentrated in one spot, their resplendence would probably equal one of the lesser orbs of the solar system.

It is not an unusual thing to hear some electrical engineer say, especially among the ranks of the younger men, "So much has been done in electrical inventions there remains so little to accomplish," or words with a similar meaning. A few years ago Thomas A. Edison, the man who has himself taken out over 700 patents on electrical subjects, used these words: "We have just started on our electrical way, and the chances of big, new electrical inventions are much greater than before the telegraph, the telephone, the electric light and the electric motor were invented." There is plenty of food for thought in these words, and plenty of encouragement for all present and future electrical engineers in America. It wouldn't seem unreasonable for a live engineer to be worried because the progressive spirit seems to be crawling along so slowly. Look for instance at the one subject of efficiency in the generation of electricity. The definition of efficiency is "the ratio of useful work for energy expended." Think of it! In the most modern electric lamp, there is an average of about five per cent of the latent power in the oil burned, or the water force used in the distant power house. Ninety-five per cent is wasted, dissipated and lost between the oil tank or intake, and the tungsten or gas filled lamp. Were every bit of the energy stored in the oil or the head of water made available when a switch were turned, the light would spring into fifty lamps instead of into one as is the case today. It is true we look upon the tungsten and other modern lamps as far ahead of the carbon filament types. So they are, but consider how little of the energy as represented in the oil or falling water is given back in these newer lamps. One inventor speaks of the incandescent and arc lamps as "simply refinements of the torch of the primeval savage, or the common candle, and primitive and inefficient in their present form." If such is the case, there is plenty of opportunity for the progressive spirit. When we get all that should be gotten of the latent power, we will have wondrous improvements and use for light. "Give us more light" is the cry in all parts of the land. "Give us the cheerfulness and protection which light brings." All country roads must eventually be lined with electric lamps, and as for the cities, they will yet be as bright at night as the highways on a June evening in the land of the midnight sun. Greater efficiency in production is all we need, and this must come through the efforts of the engineer. However, the generation and distribution of electric energy is not the only instance of low efficiency. There are many problems just as important along other lines—await-

ing new inventions and better methods—awaiting the touch of the spirit of progress.

### Limitless Opportunity

All electrical men, it appears, are not engineers, and there is much work laid out for others in the industry along distinctly progressive lines. Those who sell the product of the generating plants have still a task which needs careful study and constant effort. For a long time, engineers have drummed into the commercial men the necessity of protecting the peak. Metaphorically speaking, both engineers and salesmen were wont to stand with their heads back and faces upward, gazing at the marvelous height of some imaginary peak, and wonder when it will stop climbing in that spire-like style. But times are changing—the peak bug-a-boo is coming into its inheritance, and the progressive spirit has already given it some early payments—in the back of the neck. Two things are contributing to the peak's diminishing importance—the one is the storage of water, making power available at such hours as it may be most needed, and the other is diversity of load. The larger the average central station becomes, the more territory supplied with service—the greater should be the diversity in the connected load. And with the diversified demand, the load factor should improve, and instead of the engineers worrying about peak, that is, the number of kilowatts of daily or yearly maximum demand, the worry becomes changed into anxiety concerning the generation and delivery of the number of kilowatt hours needed to meet the requirements of consumers. With the greater diversity of added load, spread over longer hours of use, business with poor load factor, which was once considered unprofitable, may be taken on with advantage, and business with high load factor, while always desirable, is not as important as it once was to the large central station plant. But the load factor of the central station plant itself may yet be so scientifically increased that the peak will almost entirely disappear. It is not unreasonable to expect that a 90 per cent load factor may one day be a reality. But there is much work to do before the load curve nears the appearance of a straight line—before the electrical consumption of a territory supplied has reached a point approaching saturation. There are many present uses for electricity which are not nearly developed. There are many uses coming of which we may only dream of today. The factories and workshops are eagerly calling for the money saving power. How about all the business to be obtained on the farms? The stores and office buildings are asking what else we can give them. How about the homes? Some will say "Why, look at what we have done in that direction!" Well, what do we see? Electric lighting everywhere—but not enough and not used for long enough hours. Maybe one or two appliances in the average home, just to show how useful they can be. But look at all the drudgery in the home which may yet be relieved. Look at the tired women and weary men who are wearing themselves out because they do not know where to turn for assistance. And all the time we have the servant to do their



work, but they don't know it. It is someone's mission to teach them—to point the way to rest, ease and comfort and incidentally to raise the consumption of the central station over all hours of the day, and bury the peak forever.

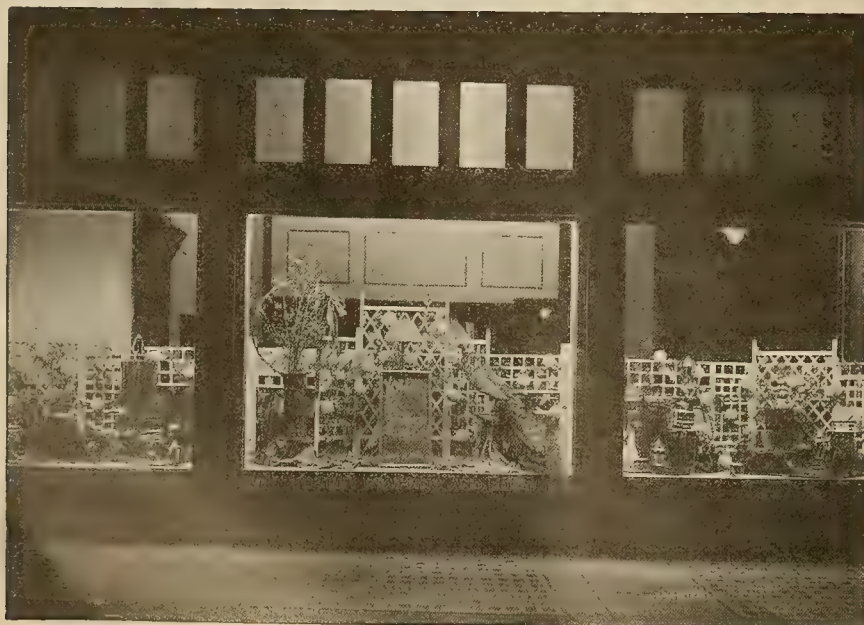
### From the Cradle to the Grave

There is no denying the fact, however, that this spirit of progress is running parallel with the strenuous life. There was a time when a man entered his own home, he might expect a certain amount of peace and quiet. Maybe that time has gone never to return. The era of electric appliances is with us, and from the moment we enter our houses, even until the instant we leave them, we are butting into some current consuming device. It takes a pilot to keep clear of cords and wires attached to irons, toasters, curling tongs, foot-warmers, vibrators, hair-dryers and automatic pianos, and if the cords are passed in safety, one's fingers are liable to be burned by handling some innocent looking article which in reality is as hot as blazes. Times are changing. A little while ago, electricity was a toy that doctors and children played with. Now we cannot get along without it. From the cradle to the grave it stays close to us. If there were only some way to blow it out, it would give complete satisfaction in every direction. The modern infant has his milk warmed by it. Growing up he may wear an electric belt for what ails him, and have his diseases and pants pressed with an electric iron. His food may be cooked electrically, and he may be run over by an electric car, carried in an electric hearse to the cemetery and there electrically incinerated. We cannot tell to what uses electricity may be put in the next world, but there is an idea prevalent that a properly constructed halo must be made of a short circuit.

The progressive spirit is evidenced not only in manufacturing and selling the product, but also in seeing that the consumer gets all that he should in

the way of attention and education, which will make the service most beneficial, satisfactory and agreeable. The man who can install an electric motor in place of a steam engine has made progress, but not more than the man who can show a customer where he can make two horsepower of energy do the work of three. The man who can induce a customer to burn two lamps where he had only one before, has made progress, but not more than the man who by scientific distribution of light can show a customer how he can make five lamps do the work of ten and have better illumination. The man who can make a customer understand the importance and usefulness of his company in a community, has shown the progressive spirit, but not to a greater extent than the man who has made a customer believe in his company's integrity and its sincere desire to serve the people.

After all, the spirit of progress is entirely a personal matter. We speak of a progressive city, when we really mean the citizens who live within its borders. We speak of a progressive company, when we really mean the men who guide its course and control its management. We speak of a progressive individual, and we mean just what we say. What we need is the ability to recognize progress when it comes, then to get behind it and help it along. There are times when some people don't or won't recognize the working of the spirit of progress, because its coming may look like inconvenience or injury to their business. In the constant evolution from one stage to another, there must be re-adjustments which will disarrange the old order of things. We had better make up our minds to accept the changes, even if they temporarily hurt us—for we cannot stop progress. Every man connected with the electrical industry holds a mandate which should compel him to welcome every forward movement, so that all may recognize that the spirit of progress is the twin sister of electricity—the Goddess of the Wires.



The Salem Electric Company, organized some six years ago in Salem, Ore., does a general electrical merchandising and contracting business. They have just installed a complete electric laundry and every Saturday the public is invited to witness a demonstration of actual handling of a washing in this up to date establishment.



# Office Records—Their Filing and Indexing

BY IRENE WARREN

(Can you find things in your files? Modern methods and modern equipment have brought filing to a very high stage of efficiency, and the Director of the Chicago School of Filing and Indexing is writing a series of helpful articles for the Journal of Electricity, analyzing the most effective systems of arranging and using business files.—The Editor.)

This short account of "Filing and Indexing" will be based on correspondence files, but many other records are filed and indexed in similar style.

In times past various methods of putting away correspondence have been tried, such as binding letters in books, putting them in boxes carefully

ents and the Miscellaneous Correspondents. The regular correspondent is one who writes a given number of letters, 3, 6, or 10 as may be determined or the one who writes an important letter. The miscellaneous correspondents are those who write the occasional letter up to the number which entitles them to become regular correspondents. The regular correspondent is of sufficient importance to give him a folder with his name on it. The miscellaneous correspondents are grouped alphabetically in folders bearing the same alphabetic letters as the guides.

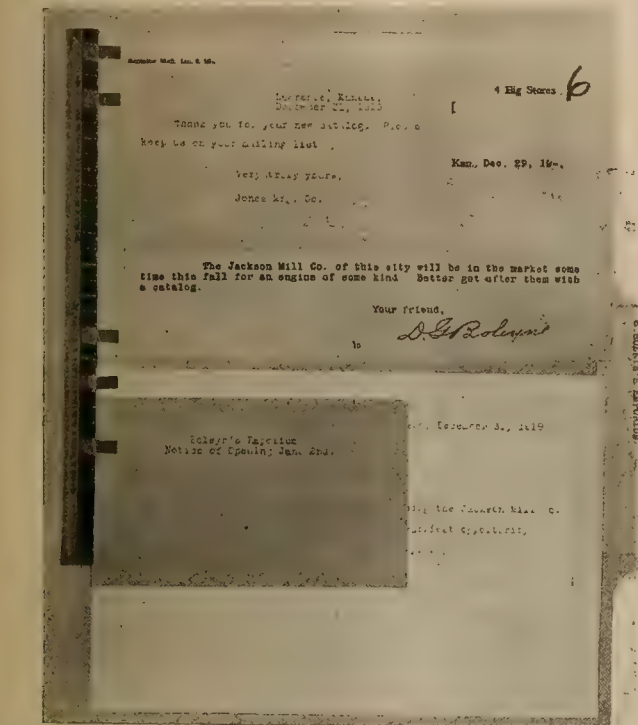
Of making folders there is no end, they are of all shapes and kinds that will fit in a cabinet. The best regular correspondence folder has a reinforced tab, and is made of a tough manila paper.

The miscellaneous correspondents are grouped in tab folders, with the tab cut in another position, and there is one miscellaneous tab folder for each guide in all systems based on the alphabetic arrangement. It is always filed back of the regular correspondents' folders in each alphabetic section.

It is advisable to bring all papers together that can be practically operated together and that is usually many more than most firms have filed together. The idea is to have only one place to look. If necessary, because of the nature of the material, different kinds of folders may be inserted in one scheme, or different colored labels may be used on the tabs.

## Accessories for Filing

For all systems, except the numeric, gummed labels have been found more convenient. They come in strips of ten labels, one hundred strips in a box. They are typewritten and pasted on to the folder. There are about ten good colors, and a rough classification of materials may thus be made in a file, folders standing back of each other in a given order

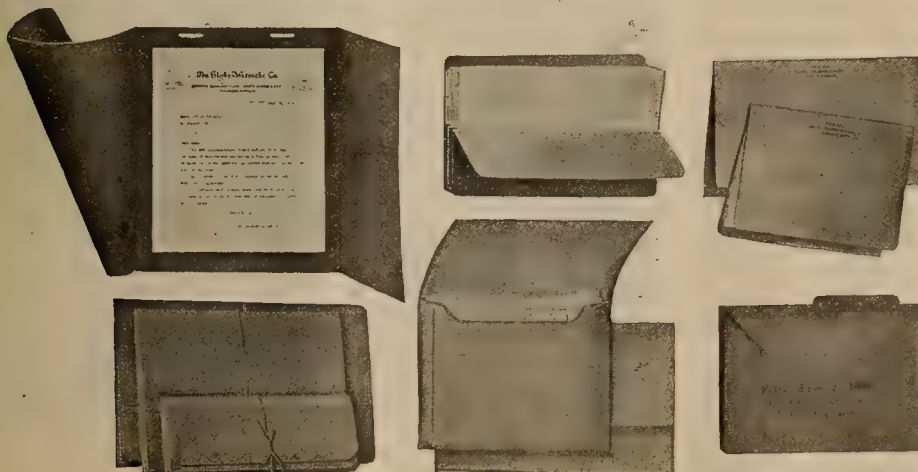


U-File-M strips placed in regular folders will take care of irregular sizes of papers and distribute them within the folders so that more papers may be filed in a given drawer.

labeled and placed on shelves, but the universal method now used, is to place letters upright in folders in vertical cabinets.

## Division of Correspondence

The correspondence in the average firm readily falls into two groups called the Regular Correspond-

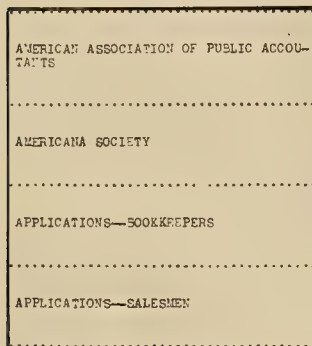


Various kinds of folders are shown here—those with sides open or closed, with or without tabs, those for papers that must be fastened together and those where papers are laid in loosely, those with long flaps and those with short flaps. Every file has some irregular papers and these may be well taken care of by inserting the right kind of special folder and marking it with the same kind of label as is used in the general file.



Smith, Brown & Jones Co.  
(white label, correspondence)  
Smith, Brown & Jones Co.  
(pink label for invoices)  
Smith, Brown & Jones Co.  
(blue label for orders)

The best guides are made of strong press board, with good size tabs projecting well above the folders. These should have tabs in the first two or three positions on the left, the tab of the miscellaneous correspondence following, and the tab of the regular correspondence to the right of these leaving a free space between the miscellaneous and the regular correspondents' folder or at the extreme right for any special guides that are needed. The order of placing



Strip of labels ready to be cut and pasted on regular correspondents' folders. The reverse side of the strip is gummed, and the titles are typed as required.

these in the file is: (1) guide, (2) regular correspondent tab folder, (3) miscellaneous correspondent tab folder. The letters and figures on the guides should be large, in clear bold type, and covered with celluloid. Metal tipped guides are necessary if heavy materials are placed in the files.

#### Arrangement of Cabinets

The cabinets may be placed around the walls, or in alcove arrangement back to back. A three-foot aisle is necessary between cabinets but five feet or more is preferable. All furniture should be so carefully placed in the room that there are no unnecessary steps taken, that the best light is secured, and the best supervision may be given the room. The sorters, desks, chairs, table for borrowers and all other equipment should be carefully planned and the room made as attractive as possible as it is primarily a department for service.

If necessary, the transfer cabinets for the old files, which are of the same size but of cheaper construction and material, may be placed eight or twelve drawers high and a suspension ladder used.

The equipment and supplies should be regarded as tools for the filing department, and the better they are the better the results. Great care should be used in selection and adapting them to the needs of the firm, in keeping them in good repair, and in being alert to buy new supplies and devices that will make for more efficient work. It is well to be on the mailing list of all the best firms furnishing supplies and equipment, to read carefully the journals that deal with such subjects, such as Printers' Ink, and System, and to attend the best exhibits of business systems and devices.

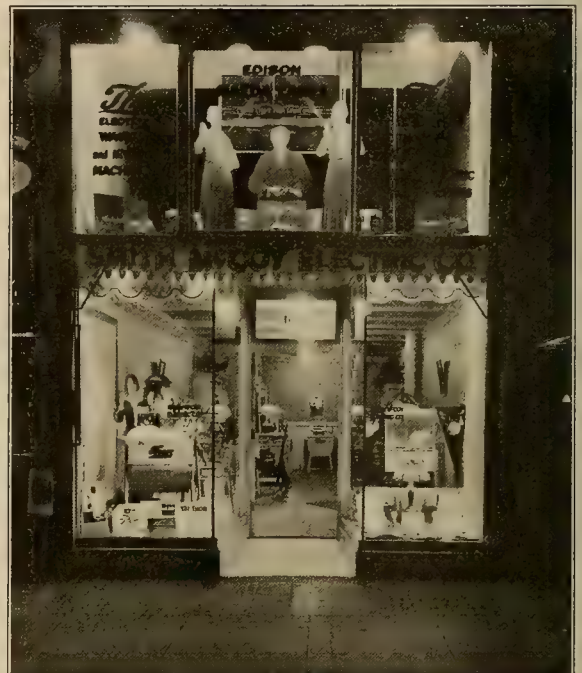
#### BUILDING A RETAIL BUSINESS

Starting with lamps as the entering wedge the Smith McCoy Electric Company of Portland have developed an electrical retail business which can boast of selling washing machines at the rate of five a day.

Originally no washing machines were handled at all, attention being concentrated almost entirely upon lamps. Solicitors were employed who brought up returns on lamp sales to over \$700 by the end of the first week.

At present the store specializes in both lamps and washing machines and does a brisk business in both.

The store occupies a comparatively small space, but the carefully arranged interior and the effective windows make it both distinctive and attractive.



The windows give a view of the interior of the shop as well as serving the usual purpose of displaying appliances. Note the upper window display and the Mazda girls, featuring lamps.



A homelike interior with no overcrowding gives distinction to this store. Jewelers' cases are becoming very popular with electrical retailers for the display of appliances.



## Essentials of Esperanto

BY W. R. DAINGERFIELD

(Considerable impetus has been given of late to the idea of a common commercial language as a means of simplifying international intercourse. The suitability of Esperanto for this purpose is evidenced by the brief grammar now appearing in these pages.—The Editor.)

35. Mi konas Johanon. En Esperanto kaj tre multaj lingvoj du verboj reprezentataj de "scii" kaj "koni" estas uzataj tie, kie en la angla ni uzas unu solan verbon "to know (tu no)." La verbo "scii" povas preni ke-frazeton, kiel: "Mi scias, ke mia Savonto vivas." "Koni" prenas nur ordinaran akuzativajon.

36. Donu al la birdoj akvon. Ne estas devige enmeti vorton signifantan nedifinan kvanton, kiel la anglan "some (sümm)," sed tio estus farebla jene: Donu al la birdoj iom da akvo. "Iom" estas adverbo, uzata kiel substantivo, kaj signifas kelkan aŭ ian nedifinan kvanton. "Da" (of, ov) estas prepozicio uzata post vorto de mezurado kaj antaŭ la mezurata materialo: Taso da kafo, tavolo da antaŭjuĝo. Se oni volas individuigi la vorton antaŭ aŭ post la "da," oni devas uzi "de": Glaso da vino estas kvanto da vino proksimume mezurebla per plena vinglaso. Glaso de vino estas glaso por vino, aŭ glaso enhavinta vinon, aŭ vinglaso mem. Funto da teo estas kvanto da teo; sed ni devas diri: "Vendu al mi funton de tia teo, kian mi aĉetis antaŭhierau." Oni ne diras "da la," ĉar la "la" individuigas.

37. Bonan matenon! Salutoj kaj similaj esprimoj ofte estas partoj de frazoj, kaj do la nomvortoj kaj adjektivoj prenas kazon saman, kiel tiun, kiun ili prenas en la plenigita frazo, jene: "Mi deziras al vi bonan matenon!"

38. Via pano estas malpli freŝa, ol mia. La prefikso "mal-" renversas la sencon de la radikoj. "Pli" signifas la anglan **more** (mor), tial "malpli" signifas less. La vorto maligita estas pli forta ol la kunresponda nea vorto, kaj ne estas sinonima al tiu ĉi, escepte nur en tiuj okazoj, en kiuj nacia lingvo havas alian radikon por esprimi nean sencon de la unua radikoj. Komparu: bona, good (gud); nebona, not good, kio estas eble ankaŭ ne malbona; malbona, bad (badd). En la angla lingvo ni havas "same," "not the same," "different"; sama, nesama, malsama; kvankam laŭsence la ideo **different** estas idente tiu de "nesama," tamen estas konvene kaj oportune havi la vorton "malsama" por traduki la anglan vorton "different."

39. Ol mia. En la frazo laste supre skribita la vorto "mia" estas uzata por "mia pano," kaj tradukiĝas per "mine (majn)." La komo, kiu estas antaŭ la kunjunkcio "ol, than (thann)," ne estas deviga, sed la plimulto de presistoj apartigas per komoj frazerajn komenciĝintajn per konjunkcio aŭ per **kio**, **kiam**, kaj similaj k-vortoj, aŭ per adverbaj participoj finiĝinta per -e kaj aludanta la subjekton.

40. El ĉiuj siaj fratoj Antono estas la malplej saĝa. En la angla tiu ĉi frazformo estus malĝusta, pro tio, ke Antono ne estas unu el siaj fratoj, sed en Esperanto kaj multaj aliaj lingvoj ĝi estas ĝusta.

35. "I know (am acquainted with) John." In Esperanto and very many languages two verbs represented by "scii" and "koni" are used where in English we use but one verb, "to know." The verb "scii" may take a "ke"-clause; as, "I know that my Redeemer liveth." "Koni" takes an ordinary accusative only.

36. "Give (to) the birds water." It is not necessary to insert a word meaning an indefinite quantity like the English "some," but it could be done, thus: Donu al la birdoj iom da akvo. **Iom** is an adverb used as a noun, and means some or some kind of indefinite quantity. "Da" (of) is a preposition, used after a word of measurement and before the name of the material measured: A cup of (da) coffee, a layer of (da) prejudice. If we wish to individualize the word before or after the "da" we must use "de." A glass "da" wine is a quantity of wine approximately measurable by a full wine-glass. A glass "de" wine is a glass for wine or a glass that contained wine, or is a wineglass. A pound of tea is a quantity or weight da tea, but we must say, "Sell me a pound de the kind of tea I bought day before yesterday." "Da la" is not used, for the reason that the "la" individualizes.

37. "Good morning!" Salutations and similar expressions often are parts of sentences, and accordingly the nouns and adjectives take the same case that they would take in the completed sentence, thus: "I desire unto you a good morning!"

38. "Your bread is less fresh than mine." The prefix "mal-" reverses the meaning of the radical. "Pli" means "more," so "malpli" means "less." The word whose meaning is reversed is stronger than the corresponding negative word, and is not synonymous with it, except when a national language has another radical to express the negative sense of the first radical. Compare **bona**, good; **nebona**, not good (which perhaps is also not bad); **malbona**, bad. In English we have "same, not the same, different," —**sama**, **nesama**, **malsama**. While in meaning the idea "different" is identically that of "nesama," nevertheless it is conventional and handy to have the word "malsama" to translate the English word "different."

39. "Ol mia," than mine. In the sentence last above written, the word **mia** (my) is used for **mia pano** (my bread), and is translated by "mine." The comma that stands before the conjunction **ol** is not compulsory, but most printers separate by commas parts of sentences beginning with a conjunction or with "who, which, that, when," and similar k-words, or with an adverbial participle in -e alluding to the subject.

40. "Of (out of) all his brothers Anthony is the least wise." In English this form of sentence would be incorrect, because Anthony is not one of his own brothers, but in Esperanto and many other languages it is correct.



## SPARKS—Current Facts, Figures and Fancy

(How long can you keep milk? How many times a year do you talk over the telephone? How many miles do you travel by elevator? We don't know, but we have collected a great deal of information on what other people do about it. Among interesting new inventions also recorded here is a labor-saving device for the preservation of the railroad conductor.—The Editor.)

Several companies have been organized in Japan to produce oxygen by electrolytic separation of water.

\* \* \*

More people ride vertically than horizontally in Manhattan. Statistics show that the elevators carry more than 10,000,000 passengers daily, a number exceeding the number of passengers carried by all the surface, elevated and subway cars.

\* \* \*

One of the wonders of a recent British exhibition was a Danish appliance for keeping milk fresh for two years or more. It is said that cream bottled in May was found to be excellent in October. No preservatives are used. The preserving force is a pressure of 2,000 pounds to the square inch.

\* \* \*

A new and powerful electrically driven winding engine has just been brought into use by an English coal company. The engine is capable of raising 150 tons per hour from a vertical depth of 900 feet. It is fitted with safety appliances which control the travel of the cage, and the most modern signaling apparatus has been provided.

\* \* \*

An English engineer has succeeded in extracting alcohol and its derivatives from coke-oven gas on a commercial scale. If applied to the whole of the coal carbonized in Britain, the process was estimated to yield 50,000,000 gallons of motor spirit a year, and would revolutionize the position of the country in regard to the supply of liquid fuel.

\* \* \*

Although ranking twelfth in population, California stands fifth in the number of personal income tax returns filed in 1917, and sixth in the total net income reported by personal returns. Of the 182,232 persons filing income tax returns for the year 1917, six showed incomes in excess of \$500,000 per annum. 176 persons admitted receiving incomes during the year of upwards of \$100,000.

\* \* \*

British inventors have made a screen similar to the German invention which will reproduce pictures in daylight or in a brightly lighted room as clearly and distinctly as those now shown in a darkened theater. This invention, known as the "Q. E. D. daylight cinematograph screen," is said to have been completely successful in a recent public demonstration. According to one of the patentees, the picture is projected from behind onto the screen which is made of a very translucent material. He believes

that the invention will prove invaluable for educational purposes, as it enables pictures to be shown in a school or lecture room in broad daylight.

\* \* \*

Five hundred exposures a second is the record in film photography made by two French scientists. They used electric sparks emitted by a special apparatus, and were able to take a detailed and accurate cinematograph record of the track of a revolver bullet. The cone of gas leaving the barrel before the bullet itself was clearly visible, and the track of the bullet could be followed. Scientists forecast that this invention will enable accurate photographs to be taken of every form of movement in the human organism.

\* \* \*

A London railroad has arranged to put into operation on its system an electrical device whereby the names of stations are indicated in the passenger cars. The system is operated by illuminating sections of the ceilings of each compartment, arranged in panels, each of which in turn becomes prominently lighted up as the journey proceeds. At the commencement of the journey the next station becomes so indicated; when that point has been left, the section or panel applying to it becomes dull, but the next becomes illuminated. Before starting a journey the motorman actuates a series of switches, and the rest of the action is automatic, the mechanism being operated by a small striker on the track between the stations. In addition to the names of the stations, it is intended to show a map of a square mile of streets around each spot, giving the chief shopping centers and places of amusement.

\* \* \*

According to the report showing the results of the census of telephones covering the year 1917, there are 53,234 separate telephone systems and lines in the United States. These lines and systems operated 28,827,188 miles of wire in the United States—enough to girdle the earth at the equator 1,153 times—and connected 11,716,520 telephones and 21,175 public exchanges. The messages or "talks" sent over these wires aggregated the stupendous total of nearly 22 billion, or, to be exact, 21,845,722,335. Figured on the estimated population of the country in 1917 this gives 211 messages per annum to every man, woman, and child. The industry in 1917 gave employment to 262,629 persons, of whom 171,119, or over 65 per cent, were women. The sum paid out in salaries and wages amounted to \$175,670,449. These employees operated plants and equipment valued at \$1,492,329,015, which yielded operating and nonoperating revenues of \$391,499,531.



## PERSONALS

**H. F. Jackson**, president and general manager of the Sierra & San Francisco Power Company, prior to its recent amalgamation with the Pacific Gas & Electric Company, has been made a vice-president of the latter company and becomes assistant general manager in charge of electrical construction. This new announcement means much to the electrical industry in the West. Mr. Jackson is known affectionately to the industry as "Captain" Jackson. He came prominently before the industry some years ago when at the first conven-



tion of the Pacific Coast Section, N. E. L. A., in Riverside during April, 1917, he was elected president of the Pacific Coast Section. It was at this interesting period that the California Electrical Cooperative Campaign was launched and later during the war period, due to his official position with the Section, he rendered able work for the industry in the West in the matter of conservation of power energy. The result of this work was that the three great hydroelectric systems serving San Francisco were inter-connected and the energy output pooled under a Power Administrator appointed by the California Railroad Commission. At the convention at Del Monte during the war period, which proved to be truly a war convention, other matters of great practical importance to the Federal Government were taken up and discussed and put through in a spirit of great helpfulness that rendered much credit to the industry on the Pacific Coast. Captain Jackson has the reputation as an able engineer along the line of electrical construction and those who go back over the past decade and review in mind the accomplishments of the Sierra and San Francisco Power Company in the building of its Stanislaus project cannot help but feel that the Pacific Gas & Electric Company, in its new reorganization, will feel his helpful influence on many an occasion.

**H. A. Barre**, electrical engineer for the Southern California Edison Company, is a recent San Francisco visitor.

**George Garrett** has been appointed city engineer of La Grande, Oregon.

**D. C. Henny**, consulting engineer of Portland, Ore., has been made one of the directors of the American Society of Civil Engineers.

**A. Turnbull**, northwest representative of the Edison Electric Appliance Company, has returned to Seattle after a month's visit to Portland.

**John W. Nicol**, mining engineer, spoke before the Engineers' Club of San Francisco on January 22nd on "Some Problems in the Mexican Situation."

**John M. Gregory** has been appointed Executive Secretary of the East Bay Electrical Trades Association, with headquarters at 518 Pacific Building, Oakland, California.

**F. J. Early**, secretary and treasurer of the Nevada Valleys Power Company, Lovelocks, Nevada, was a guest at the San Francisco Electrical Development League luncheon, January 19th.

**Arthur Baldwin**, senior vice-president of the McGraw-Hill Co., owners of the Journal of Electricity, is a recent San Francisco visitor and is now en route to his home office in New York City.

**M. C. Hixson** and **W. E. Camp** are joint authors of a useful illustrated pamphlet, issued by the General Electric Company, entitled "Electrically Operated Irrigation Plants, for the State of California."

**J. W. Perry**, general manager of Electrical and Auto-Motive Equipment of the H. W. Johns-Manville Company, New York, **B. C. McClure**, general manager of the Insulation and Power department, **J. M. Berdan**, general manager of the Building and Roofing department, and **L. R. Hoff**, general sales manager, all of the above company, are on the Pacific Coast attending the annual sales conference of the Pacific Coast division.

**A. H. Griswold**, plant engineer for the Pacific Telephone & Telegraph Company, has recently returned to San Francisco from France, where he went to install some important telephone work for the Western Electric Company. It will be recalled that Mr. Griswold returned again to France shortly after the Armistice signing, where he had previously in charge, as a lieutenant-colonel of the Signal Corps, all of the communications back of the trenches for the Allied forces.

**B. Badrian** and **R. G. Chamberlain**, the district managers respectively of the San Francisco and Seattle districts for the Hurley Machine Company, have just returned from Chicago where a conference of "Thor" district managers and store managers has just been held. Much enthusiasm was generated at the conference due to the broad vision of Neil Hurley and E. N. Hurley, well-known national figures, which impressed itself upon all present in regard to the business possibilities immediately ahead in the nation.

**A. S. Kalenborn**, chief electrical engineer and superintendent of power for the Cerro de Pasco Mining Company of Cerro de Pasco, Peru, has returned to San Francisco after two years' absence in South America. Mr. Kalenborn is contemplating remaining in this country and entering the field of consulting engineering. It will be recalled that prior to Mr. Kalenborn's going to South America he was chief engineer of the San Joaquin Light & Power Corporation. He comes back with a host of experience and interesting information concerning the great republic to the south, and in his work in South America he had the distinction of operating the plant located at the highest altitude of any hydroelectric plant in the world, being at an elevation of 12,500 ft. above sea level.

**Captain R. W. A. Brewer**, who until recently was a captain in the British Army, detailed to the Pacific Coast for



the inspection of munitions, and who later became a consulting engineer with headquarters in San Francisco, has now accepted a permanent position as consulting engineer for a large automobile manufacturing concern situated in Cleveland, Ohio. Capt. Brewer has contributed a number of helpful articles to the Journal of Electricity on various subjects. In this issue may be found an able article on the vacuum valve

for radio work, that came under his inspection during the war. Other discussions have been on the subject of fuel and its application and economy in steam power plant generation. Mr. Brewer is recognized as one of our ablest technicians in the carburization of gas engine cylinders and all those things which have to do with the theory and design of electrical apparatus, particularly along the line of radio activity and the use of the vacuum valve in wireless telegraphy. The West loses in him one of its ablest engineers and technical writers.



Paul M. Downing, who has been chief engineer of the hydroelectric department of the Pacific Gas & Electric Company for some years, has just been made a vice-president of the Pacific Gas & Electric Company and will be in charge of electrical operation for the company. Mr. Downing has long been recognized as one of the ablest operating engineers of the nation. During the war period he served as manager of operation for the three inter-connected systems of the Pacific Gas & Electric Company, the Sierra and San Francisco Power



Company, and the Great Western Power Company. It was during this period that over a billion and a half kilowatt-hours of energy were delivered in one year, which statistics of the nation showed to be the greatest combined output ever delivered by an inter-connected system anywhere in the nation, overtopping even that of the Commonwealth Edison Company of Chicago. The West recognizes in Mr. Downing an able operating engineer and his new promotion is meeting with frank acknowledgment and congratulation on all sides.

Charles L. Eshleman, sales manager of the Union Metal Standards Company, has just completed a trip throughout the Pacific Coast.

T. E. Reed, formerly of the Westinghouse Company, has recently joined the office staff of the Majestic Electric Development Company.

L. A. Somers, managing director of the Coast Equipment Company, San Francisco, has just returned from a ten days' trip through Southern California.

G. R. Brandon, a consulting engineer with the General Combustion Company with headquarters in Chicago, is a recent Los Angeles and San Francisco visitor.

S. I. Shida, chief electrical engineer of the Kiso Electrical and Industrial Company, Japan, is in San Francisco, preparatory to a business tour of the United States.

E. A. West, chief engineer and general superintendent of the Denver Tramways company, who has been spending some time in San Francisco, recently returned to Denver.

Lawrence Chaffee, of the Chaffee Electric Company, Visalia, California, was a guest at the luncheon of the San Francisco Electrical Development League on January 26th.

W. D'A. Ryan has come out from New York to be present at the inauguration of the Broadway Lighting System in Los Angeles. He recently spent a short time in San Francisco.

Captain Addison N. Clark, who has been connected with the Magnavox Company since leaving the service, has resigned his position with that company to become associated with Edison Ltd.

R. H. Ballard, president of the National Electric Light Association, arrived in New York on Jan. 23rd, after stopping over at Salt Lake City, Denver, Omaha, Chicago and Cleveland. Mr. Ballard is expected to arrive back on the Pacific Coast about February 20th.

Chas. E. Gorton, chairman of the American Uniform Boiler Law Society, and a member of the Code Committee of the American Society of Mechanical Engineers, is making a tour of the States to promote the legal adoption of the A. S. M. E. code. Mr. Gorton recently passed through San Francisco.

C. H. Bromley, associate editor of Power, with headquarters in New York City, is a recent Pacific Coast visitor at Seattle, Portland, San Francisco, Los Angeles, and other

engineering centers, where he is visiting and collecting data on typical hydroelectric and steam electric power plants.

Kent A. Hawley, a graduate of the University of California, formerly connected with C. C. Moore & Company of San Francisco, and more recently on the electrical zone of the New York, New Haven & Hartford Railroad, is now in charge of the New York office of the Locke Insulator Manufacturing Company of Victor, N. Y.

R. B. Woolley, who has been director of publicity of the Society for Electrical Development, Inc., for the past two years, is now with Thos. F. Logan, Inc., Advertising Agency, New York City. Mr. Woolley, who has been seventeen years in sales and advertising capacities, joined the agency after service overseas. He will specialize on electrical and merchandising accounts.

Roy J. Heffner, chairman of the technical department of the University of California extension division, has returned from a tour of the East where he has been visiting all of the greater universities which incorporate extension divisions in their work. Mr. Heffner plans to utilize the best of the many ideas and suggestions gathered and so continue the University of California in its place of leadership among the great universities of the world.

H. C. Hopkins, of the publicity department of the Westinghouse Electric & Manufacturing Company, is back in San Francisco after an extended trip to the East. Mr. Hopkins spent some time in Pittsburgh getting in touch with the 1920 plans for the publicity organization of his company. In visiting several of the industrial and commercial centers of the East, he made an investigation of business conditions in that section of the country.

Harold D. Sammis, since June, 1913, connected with the California Railroad Commission in various capacities, has resigned to accept the secretaryship of the Public Service Commission of the state of Nevada. The resignation takes effect on the first of February. The appointment is a recognition of the ability displayed by Mr. Sammis in connection with the work of the California Railroad Commission, which is looked upon as a leader in utility regulation.

#### OBITUARY

Howard Joslyn, for fifteen years city electrician of Seattle, resigning from that position seven months ago, died

at his home, Edgewood Farm, across Lake Washington from Seattle, on the morning of January 15. He had been ill for several weeks with pneumonia. Mr. Joslyn was born May 17, 1869, at Crawfordsville, Indiana, where he resided for twenty years. He graduated from Wabash College in 1889, coming to Seattle the same year. Shortly afterward he went to Tacoma as a representative of the Westinghouse Company and



subsequently served as city electrician for several years. Returning to Seattle in 1898 as purchasing agent for the Snoqualmie Falls Power Company, in 1904 he became city electrician of Seattle. This position he retained up to last June when he resigned to make his home at Edgewood Farm, a poultry ranch near Bellevue. Mr. Joslyn was a member of the American Institute of Electrical Engineers and of the Pacific Northwest Society of Engineers, being secretary of the latter organization at the time of his death. Mr. Joslyn was well known in electrical engineering circles of the Northwest and enjoyed a large degree of popularity.

Albert W. Bullard, formerly vice-president and general manager of the Great Western Power Company, died suddenly in the East on January 19th.



## Meeting Notices for Electrical Men

(An important convention of the California Association of Electrical Contractors and Dealers is a feature of recent activities in electrical circles. Contractor-dealers in the Northwest report interesting meetings, while local sections of engineering societies send in news of many exceptional papers and addresses.—The Editor.)

### N. E. L. A. Executive Committee

At a recent meeting of the Executive Committee of the National Electric Light Association certain new points were brought up in committee reports. The Company Sections Committee noted a tendency among companies to form employees' clubs rather than company sections, and recommended the establishment at N. E. L. A. headquarters of a separate bureau for the supervision of Company Section work, the bureau to include men who can travel among the Sections.

In a report on publication work, a statement was made of plans to publish the Rate Research Bulletin and the Rate Book at N. E. L. A. headquarters instead of in Chicago; and slightly to change the character of the N. E. L. A. Bulletin, making it "lighter and more readable."

An extended report was made on the work of coal service to member companies during the strike.

H. H. Aylesworth, executive assistant to the president, suggested the combining of some of the committees now existent in the Association's plan of organization, and the creating of additional ones such as a committee on uniformity in valuation, uniformity in state laws as to regulation, etc.

It was arranged to have frequent conferences between Mr. Wakeman of the Society for Electrical Development, and Mr. Aylesworth, in order to prevent duplication of effort by the two organizations.

### San Francisco Section

#### A. I. E. E.

On January 21 the San Francisco Section of the American Institute of Electrical Engineers met with members of the American Institute of Mining Engineers to listen to a paper by B. B. Beckett on "Electricity in the Gold and Silver Mining Industry." The paper covered the subject thoroughly, presenting data of great timely interest.

### N. E. L. A. and A. S. M. E., Portland

The regular monthly meeting of the Portland sections of the National Electric Light Association and the American Institute of Electrical Engineers was held at Multnomah Hotel at 8 p.m., Jan. 13, 1920. Professor William Conger Morgan, of Reed College, talked on "The New Theory of Physics" in his own original way. The gathering was co-educational, and dancing and a buffet lunch were enjoyed by more than 100 members and their friends.

### A. I. E. E., Seattle Section

The regular January meeting of the Seattle Section of the American Institute of Electrical Engineers was held on

Jan. 20, 1919, in the Chamber of Commerce Assembly Room, at 8 p.m. The speaker of the evening was Prof. William Spraragen of the University of Washington, his subject being "Electric Welding of Mild Steel," with special reference to shipbuilding. During the war Professor Spraragen was connected with the National Research Council as Assistant Chairman of the Welding Research Committee. The meeting was preceded by the usual dinner at 6:30 p.m. at the Butler.

### Oregon Association of Electrical Contractors and Dealers

At the regular meeting of the First District of the Oregon Association of Electrical Contractors and Dealers, held Monday, January 12, 1920, the following named members

were appointed to act as the District Executive Committee for the following year: F. A. Bauman, W. O. Fouch and J. H. Sroufe. The retiring committee was tendered a rising vote of thanks in appreciation of the efficient work accomplished by them during their term of administration.

Mr. Mundt, the secretary, called the attention of the meeting to the fact that the electrical industry had been held up, at a meeting of the Commercial Club, as being conspicuously backward in the matter of employing ex-service men. He mentioned that although practically every firm in the Association had done its share individually, the Association had not acted as an organization and advertised the fact, with the consequent misunderstanding on the part of the Chamber of Commerce. The secretary was instructed to canvass the membership to obtain the information in ref-

erence to the number of ex-service men employed and communicate with the Chamber of Commerce.

At a meeting of the Executive Committee for the First District of the Oregon Association of Electrical Contractors and Dealers held Wednesday, January 15th, at the Oregon Grill, Mr. Frank Bauman was elected chairman and the following committees appointed:

Jobbers Committee—J. H. Sroufe, W. O. Fouch, F. A. Bauman, Ed. Pierce, E. L. Knight, A. E. McCoy.  
Retail Committee—J. F. Barrett.  
Contractors Committee—R. C. Kenney, A. S. Halls.  
Membership Committee—R. W. Larsen.  
Labor Committee—Frank Pierce, J. R. Davidson.  
Price Book Committee—C. P. Scott.  
Entertainment Committee—Ed. Pierce, H. H. Fitzpatrick, M. J. Walsh.  
Welfare Committee—S. C. Jaggar, R. N. Lewis.

### Electrical Supply Jobbers' Association

The Electrical Supply Jobbers' Association of the Pacific Coast announces a meeting to be held at Del Monte, February 26, 27 and 28, 1920.

## BUILDERS OF THE WEST — LXX



LEE H. NEWBERT

That the West should have contributed ideals in cooperative helpfulness, equaled nowhere else in the nation today, is a matter for gratification to all those who have followed the interesting intensive development of electrical energy west of the Rockies during the past decade. Not alone has the physical development of hydroelectric network progressed to a degree without equal in other sections of the country, but in the merchandising of the electrical product, in energy and in appliances, a certain something has been added that adds to the profit in the industry, and to a harmonious understanding with the public, that is today being sought as a model for many other sections of our country. To Lee H. Newbert, Chairman of the Advisory Committee of the California Electrical Cooperative Campaign, this issue of the Journal of Electricity is affectionately dedicated for his lasting and enduring work in the establishment of ideals of helpfulness in the West that have made possible these new planes of attainment.



### Convention of the California State Association of Electrical Contractors and Dealers

The first 1920 meeting of the California State Association of Electrical Contractors and Dealers was held at Sacramento on January 17th. The gathering was held at the Travelers' Hotel in that city, and was one of the best-attended meetings ever conducted by the State Association. On Saturday morning, January 17th, the State Executive Committee convened, and among other important actions decided to continue its support of the California Electrical Cooperative Campaign, with an increased appropriation of \$3600. This decision was unanimously ratified by the entire body at its afternoon session.

The general meeting was called to order by Clyde L. Chamblin, who in assuming his new duties as president of the State Association welcomed the delegates from all sections of California. Mr. Chamblin expressed confidence that with the spirit manifested by the gathering the new year would prove to be the most prosperous in the history of the organization. He emphasized the fact that localism must disappear, and that all must work for the good of the whole, uniting as have other branches of the industry. J. W. Redpath, secretary of the Association, reported on the progress of organization work throughout the state, especially the institution of promising new sections in southern California. Many new applications for membership in the State Association were read and approved. It was agreed that the Advisory Committee of the California Electrical Cooperative Campaign be consulted in regard to possibility of change of representation on that board for the contractor-dealers.

James A. Woods of Sacramento reported on the meeting of the Motor Section, which was held at the luncheon hour, and announced that a permanent organization had been perfected, with himself as chairman, H. N. Nelson as vice-chairman, and Louis R. Ardouin as secretary.

W. D. Kohlwey reported for the Retail Section; Earl E.

Browne spoke on the activities of the advisory committee working with the Industrial Accident Commission in the formulation of Safety Orders; and Glen E. Arbogast outlined the extensive advertising campaign which had been conducted in southern California by the dealers during the holiday season. M. L. Scobey, member of the Advisory Committee of the California Electrical Cooperative Campaign, reported that during the coming year the contractor is to be given more attention, pointing out that a special field agent to work among the architects is to be appointed.

Mr. Arbogast showed the gathering the plans for wiring a model bungalow, as published in southern California under his direction, and urged that more of this educational work be carried on. H. H. Courtright of Fresno presented the report for the commercial committee. Reports of conditions in the territories of the various local sections were given, among those that spoke being: C. Osborn, Turlock; R. V. Oyler, Berkeley; John M. Gregory, Oakland; Tom Bennett, San Francisco; Earl E. Browne, San Francisco; J. C. Hobrecht, Sacramento; F. C. Sherman, Rio Vista; W. E. Cox, Santa Cruz; Wm. Blide, Santa Cruz; H. H. Courtright, Fresno; W. H. Gribble, Chico; W. S. Cass, Chico.

D. E. Harris of San Francisco spoke on the importance of contractor-dealers securing membership in the National Electric Light Association. Art Rowe gave an inspirational talk on the necessity of cooperation with the active workers for the good of the industry. "Give flowers to the workers while they are laboring," he urged, "don't wait till they have passed away to show your appreciation."

The banquet in the evening at the Travelers' Hotel was in every way a decided success, 104 being in attendance. Clyde L. Chamblin acted as toastmaster. The first speaker of the evening was Charles G. Johnson, State Superintendent of Weights and Measures, who told in an interesting manner of the work of his department. Lee H. Newbert, chairman of the Advisory Committee of the California Electrical Co-



EXECUTIVE COMMITTEE, 1920, CALIFORNIA STATE ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS

At the first monthly convention, Travelers' Hotel, Sacramento, January 17

Standing, from left to right: F. T. Broiles, Santa Ana; Walter Cox, Santa Cruz; James Woods, Sacramento; W. S. Cass, Chico; E. E. Browne, San Francisco; C. E. Osborn, Turlock; C. B. Kenny, Oakland.

Seated, from left to right: H. H. Courtright, Fresno; G. E. Arbogast, Los Angeles; J. W. Redpath (secretary); C. L. Chamblin (president), San Francisco; W. H. Gribble, Chico; T. J. Bennett, San Francisco; Robert Oyler, Berkeley.



operative Campaign, outlined the activities of that organization from its beginning and showed what it has accomplished for the upbuilding of the contractor-dealers' business. Mr. Newbert also dealt with the problems of the power companies in the development necessary in the next few years, and urged cooperation in the forming of a proper public opinion, which is requisite for the financing of projects now under way.

H. C. Hopkins, of the publicity department of the Westinghouse Electric & Manufacturing Company, gave an interesting account of business conditions in the East as observed by him upon his recent trip. Mr. Hopkins told of the interest of electrical merchandisers in the East as to the practical results of the California Electrical Cooperative Campaign, about which they have all heard, and he advised the contractor-dealer to put "his house in order" so as to meet the critical gaze of visitors who will swarm out to California in May. C. C. Hillis, of the Electric Appliance Company, San Francisco, gave an outline of the problems which today confront the electrical jobber. The only solution to the servant problem, said Mr. Hillis, lies in the extended utilization of electric household appliances.

A telegram from A. E. Wishon, president of the Pacific Coast Section, N. E. L. A., was read. Mr. Wishon sent to the gathering his congratulations, and wished a prosperous year to Mr. Chamblin, the incoming president. In closing the meeting, Mr. Chamblin again thanked those present for their attendance and expressed the opinion that with such hearty support as had been shown throughout the day's proceedings the State Association was bound to have its best year in 1920.

The full list of those present at the banquet is as follows:

Clyde L. Chamblin, California Electrical Construction Co., San Francisco  
 Lee H. Newbert, manager Commercial Department, Pacific Gas & Electric Company, San Francisco.  
 Charles G. Johnson, State Superintendent of Weights and Measures, Sacramento.  
 Howard W. Angus, secretary California Electrical Cooperative Campaign.  
 J. C. Hobrecht, J. C. Hobrecht Company, Sacramento  
 Aubrey Drury, Associate Editor, Journal of Electricity  
 R. M. Alvord, General Electric Company, San Francisco  
 William H. Gribble, Western Gas & Electric Appliance Co., Chico  
 H. N. Nelson, Enterprise Electric Works, San Francisco  
 F. N. Buzzell, Buzzell Electric Works, San Francisco  
 O. Kurtz, San Francisco  
 C. J. Newbery, F. E. Newbery Electric Co., San Francisco  
 M. E. Hickox, Pacific States Electric Co., San Francisco  
 F. J. Wallace, The Electric Shop, Sacramento  
 H. J. Holt, Holt Electric Shop, Woodland  
 L. J. Brown, Western Electric Co., San Francisco  
 S. H. Curry, Fresno Electric Co., Fresno  
 C. A. Quilty, Century Electric Co., San Jose  
 F. S. Thomas, Valley Electrical Supply Co., Fresno  
 T. D. MacMullen, Majestic Electric Development Co., San Francisco  
 W. R. Dunbar, Westinghouse Electric & Manufacturing Co., San Francisco  
 Frank H. Mills, Electric Appliance Co., San Francisco  
 Tom Bennett, Rex Electric Co., San Francisco  
 F. A. Gerhardt, Crouse-Hind Co., San Francisco  
 W. H. Hemington, City Protective Electric Co., San Francisco  
 C. B. Kenney, NeFaye-McKenny Co., San Francisco  
 John M. Gregory, secretary East Bay Electrical Trades Ass'n, Oakland  
 E. A. Chloupek, Kimball Electric Co., Oakland  
 J. T. Stewart, Standard Electric Construction Co., San Francisco  
 William H. Beamer, J. C. Hobrecht Co., Sacramento  
 S. B. Gregory, Arrow Electric Co., San Francisco  
 R. J. Holtermann, Holabird Electric Co., San Francisco  
 M. Meade, California Machinery and Electrical Engineering Co., Sacramento  
 W. S. Cass, Chico Electric Supply Co., Chico  
 Robert L. St. John, State Department of Engineering, Sacramento  
 G. M. Simonson, State Department of Engineering, Sacramento  
 James A. Woods, California Machinery and Electrical Engineering Co., Sacramento  
 F. T. Broiles, International Electric Co., Los Angeles  
 S. P. Russell, H. B. Squires Co., San Francisco and Los Angeles  
 H. W. Lewis, Lewis Electric Co., Fresno  
 F. M. Robinson, Electrical Contractor, Fresno  
 Clark Baker, National Mazda Works of General Electric Co., Oakland  
 Elbert Kramer, Westinghouse Electric & Manufacturing Co., San Francisco  
 Stephen E. Dunn, Westinghouse Electric & Manufacturing Co., San Francisco  
 H. W. Rosenberg, Pacific Electric Construction Co., San Francisco  
 Theodore DePass, Atlas Electric Co., San Francisco  
 H. Surryhne, A-1 Electric Construction Co., San Francisco  
 H. H. Courtright, Valley Electrical Supply Co., Fresno  
 M. L. Scooby, Home Electrical Co., San Francisco  
 R. A. Balzari, Westinghouse Electric & Manufacturing Co., San Francisco  
 L. R. Ardouin, secretary San Francisco Association of Electrical Contractors and Dealers.  
 Louis Levy, Levy Electric Co., San Francisco  
 E. P. Markee, Edison Lamp Works, General Electric Co., San Francisco  
 Clyde L. Smith, Central State Electric Co., Fresno  
 Clifford Prudhomme, W. P. Hyatt Electric Co., Sacramento  
 W. P. Hyatt, W. P. Hyatt Electric Co., Sacramento  
 George H. Curtiss, Electric Ry. & Manufacturing Co., San Francisco

George A. Zelt, J. C. Hobrecht Co., Sacramento  
 C. J. Thelen, Electric Ry. & Manufacturing Co., San Francisco  
 P. J. Hobrecht, J. C. Hobrecht Co., Sacramento  
 Frank Killam, Pacific States Electric Co., San Francisco  
 W. A. Murphy, Bright Spot Electric Co., Stockton  
 Marcel L. Hirsch, Alexander & Lavenson, San Francisco  
 E. E. Browne, Browne & Langlais, San Francisco  
 H. J. Mayo, Benjamin Electric Manufacturing Co., San Francisco  
 G. W. Spencer, Spencer Electric Co., Oakland  
 O. E. Smith, Great Western Power Co., Sacramento  
 F. E. Kaye, Great Western Power Co., San Francisco  
 T. J. Dillon, Great Western Power Co., Sacramento  
 W. A. Weigt, Sterling Electrical Co., Sacramento  
 A. P. Peck, Holabird Electric Co., San Francisco  
 C. W. Beaton, City Electrician, Sacramento  
 J. O. Tohey, Pacific Gas & Electric Co., Sacramento  
 W. E. Camp, General Electric Co., Sacramento  
 George B. Sanford, Great Western Power Co., Sacramento  
 Carl Mixer, Mixer Electric Co., Lodi  
 L. P. Van Atta, Pacific States Electric Co., San Francisco  
 Chet Osborn, C. E. Osborn Co., Turlock  
 C. J. Franke, Commercial Electric Co., Stockton  
 W. T. Flanagan, Electric Equipment Co., Stockton  
 S. G. Gearhart, General Electric Co., Stockton  
 William Blide, Blide Electric Co., Santa Cruz  
 Walter Cox, Cox Electrical Co., Santa Cruz  
 R. J. Finshly, California Mech. & Elec. Engineering Co., Sacramento  
 F. H. McGinnis, Sacramento Appliance Co., Sacramento  
 F. E. Boyd, General Electric Co., San Francisco  
 D. E. Harris, Pacific States Electric Co., San Francisco  
 B. E. Cunningham, Vallejo Electric Light & Power Co., Vallejo  
 Albert Caspar, Vallejo Light & Power Co., Vallejo  
 Arthur E. Rowe, Garnett Young & Co., San Francisco  
 H. C. Hopkins, Westinghouse Electric & Manufacturing Co., San Francisco  
 C. C. Hillis, Electric Appliance Co., San Francisco  
 Robert King, King's Electric Co., Oakland  
 R. V. Oyler, Capitol Electric Co., Berkeley  
 W. D. Thomas, Electric Appliance Co., San Francisco  
 C. W. Farrow, electrical contractor, San Francisco  
 Ed. H. Brumfield, Brumfield Electric Sign Co., San Francisco  
 B. J. Doherty, electrical contractor, San Francisco  
 J. W. Redpath, secretary California State Association of Electrical Contractors and Dealers.

#### San Francisco Section, A. S. M. E.

Report from San Francisco Section Delegate to Conference of Section Representatives, A. S. M. E., December, 1919.

BY ROBERT SIBLEY

The San Francisco Section prides itself upon the fact that it has instituted in the Far West the model section of the Society. Detail description of the section organization and activity was set forth in our report to the section conference at the annual meeting of the Society in New York, December, 1918.

During the past year remarkable strides forward have been made.

Under the able chairmanship of W. F. Durand, Professor of Mechanical Engineering, Stanford University, and a past vice-president of the Society, the San Francisco Section has first made a survey of war activities of its membership, and quite recently a survey of research activities has developed the fact that considerable important research activity is now under way that will later prove of national value.

#### Organization —

Since a complete description of our organization was set forth in the 1918 report as noted above, no effort will here be made to enter into further detail concerning the interesting and efficient method established in San Francisco Section life, as those interested may refer back for full details.

#### Meetings —

We are this year following the scheme instituted last year of informal luncheons each Thursday at the San Fran-



W. F. Durand, chairman San Francisco Section, A. S. M. E.



J. A. Kinkead, secretary San Francisco Section, A. S. M. E.



cisco Engineers' Club. We have monthly evening meetings for discussing technical papers. Three meetings a year in the evening are devoted to joint gatherings with four other national engineering society local sections.

#### Papers —

The papers at the monthly meetings are usually of current problems concerning mechanical engineering subjects of peculiar importance in the West, while the joint engineering meetings discuss problems of wide general interest to the engineering profession as a whole.

#### Membership —

We draw our membership from a community of about one million inhabitants; our mailing list numbers over five hundred members of the Society.

#### Research —

As noted above, a complete survey of research activities has been instituted and completed during the past year. The results of this survey are now on file with the Research Committee of the Society.

#### Relations with the Public —

Great activity is being manifested by our membership along lines of bettering relations of the engineering profession with the public. Considerable thought expressed jointly with four other local sections of national engineering societies is being given with respect to the subject of licensing of engineers.

#### Sections Development in General —

In the Far West emphatic need is felt for the establishment of a Pacific Coast headquarters for the Society. It is believed that the retaining of an active, enthusiastic secretary and permanent headquarters—perhaps supported jointly by the national societies—would not only add vastly in increasing interest in national engineering society movement but, from a financial viewpoint, the resultant inflow of money from vastly increased membership, would more than pay for the outlay.

San Francisco Section extends greetings to her sister sections throughout the nation and the hope is entertained that all visiting members will make themselves known, for a cordial welcome is always in waiting for all who visit this happy section of our society situated in the City by the Golden Gate—San Francisco.

#### San Francisco Electrical Development League

The meeting of January 12th was taken up with the "send-off" to Russell H. Ballard, president of the N. E. L. A., before his departure for the East. Robert Sibley, editor of the Journal of Electricity, spoke on "The Vision of 1920." The proceedings of this meeting are described at length elsewhere in this issue.

On January 19th, the League members listened to a discussion of "The Elements of Rate-Making," by W. G. Vincent, Jr., valuation engineer of the Pacific Gas & Electric Company. Mr. Vincent gave a very instructive talk dealing with the history of utility rates on the Pacific Coast and showed by means of charts and diagrams the means by which equitable rates are arrived at. His remarks were supplemented by Senator C. P. Cutten, rate attorney for the Pacific Gas & Electric Company, who ably presented the legal aspects of the subject. James B. Black, of the Great Western Power Company, acted as chairman of the day.

An amendment to the Constitution of San Francisco Electrical Development League to lengthen the term of office for its officers to one year, read at a meeting on Monday, January 19, 1920, to be voted upon Monday, February 2, 1920, is as follows:

#### Article IV, Section 3:

The term for which all officers shall serve shall be one year, from March 1st to March 1st, or until their successors are elected or appointed.

#### Article V, Section 2:

At the business meeting of the League held in February, officers and members of the Executive Committee shall be elected by ballot. Prior to the meeting of the League held in February the President shall appoint a Nominating Committee of five (5) members, whose duty it shall be to submit a report at the business meeting in February, giving names of one

or more members whom they would recommend to be placed in nomination for each of the offices being filled at that election.

#### PACIFIC COAST CONVENTION A. I. E. E.

The Pacific Coast Convention of the American Institute of Electrical Engineers will be held in the Multnomah Hotel, Portland, Oregon, on July 21st, 22nd and 23rd, 1920. The following chairmen of committees have been appointed:

O. B. Coldwell, programme.

C. P. Osborne, publicity.

W. C. Heston, arrangements.

#### NEW MEXICO ELECTRICAL ASSOCIATION

The sixth annual convention of the New Mexico Electrical Association will be held at Albuquerque, New Mexico, on Feb. 16th, 17th and 18th, 1920.

Among the papers and addresses will be:

"The Coal Situation"	D. E. Bent, Tucuman Light & Power Co.
"Fire Loss by Electricity"	L. A. Barley, Rocky Mountain Fire Underwriters' Association, Denver
"My Relation as Legal Advisor to the Association"	Albert Simmis
"Developments in the Electrical Industry"	B. C. J. Wheatlake, Mountain Electric Co., Denver
"Outlook for Electrical Merchandising, Year 1920"	J. J. Cooper, Mountain Electric Co., Denver
"Westinghouse Subject"	K. E. Van Kuran, Westinghouse Electric & Mfg. Co., Los Angeles
"The Public Relations of Public Utilities"	J. F. Greenawalt, Mountain States Telephone & Telegraph Co., Denver
"A Scientific Paper"	Prof. R. W. Goddard, New Mexico College of Agriculture and Mechanical Arts
"A Paper on the Lamp Industry"	W. C. Wurfel, Westinghouse Lamp Co., Los Angeles
"A Scientific Paper"	S. E. Doane, Chief Engineer, National Lamp Works, Cleveland, O.

The meeting on Tuesday morning, February 17th, will be opened by R. H. Ballard, president of the National Electric Light Association, with an address entitled "Relation of the N. E. L. A. to the Central Station."

All papers and addresses will be followed by discussion. An executive session, with election of officers, will be held on Wednesday afternoon, February 18th. The annual banquet will be on Tuesday evening.

#### Electrical Banquet

A dinner meeting of those interested in the electrical industry was given under the auspices of the East Bay Electrical Trades Association in the banquet room of the Pacific Building, on Jan. 27th. Over one hundred electrical men from all branches of the industry were gathered together at this meeting, which represented the power companies, manufacturers, jobbing houses and contractor-dealers.

Hugh Kimball, president of the association, presided. Among other things, he stated that the work of the association was being conducted along educational and ethical lines, and that its primary purpose was to encourage the confidence of the public in the electrical contractor-dealer and the confidence of honest competition among the members. The principal topic of discussion was the work of the California Electrical Cooperative Campaign. A review of this work was made in a most interesting manner by Mr. D. L. Harris of San Francisco, a member of the campaign committee. He showed that the California idea of cooperation all along the line ultimately expressed itself in terms of service to the consumer. He further stated that the idea of a campaign of cooperation had originated in this state and that the record of the activities of the California Electrical Cooperative Campaign had invaded the East, where it was generally conceded California had set the pace in bringing to the home the proper appreciation of things electrical.

Other phases of campaign and association work were reviewed by Captain Howard Angus, secretary of the Campaign, Merrel Hixson, advertising director, R. D. Holabird of Oakland, Arthur E. Rowe of San Francisco, and Clyde B. Chamblin, president of the California State Association of Electrical Contractors and Dealers. The constructive policies presented by these men reflect credit on the electrical industry and the local association should feel gratified at the success of the meeting.



## An Inspiration for 1920

BY FREDERICK S. MYRTLE

(The most significant meeting of the year preparatory to that of the great convention of the National Electric Light Association in Pasadena, California, May 18-21, 1920, was held in San Francisco, Jan. 12, 1920. The matter brought out at this meeting proved so helpful in spreading broadcast the vision to be held in mind by men of the Electrical West that a description is here given of this meeting at considerable length. The author is Editor of Pacific Service Magazine and a recognized writer of wide acquaintance on matters electrical. — The Editor.)

That the West has a greater message for the East than the East has for the West, and that the vision of the West has been broader of scope and more fruitful of accomplishment than any vision that can be credited to our sister states on the other side of the Rockies was the prevailing sentiment in an important gathering held at the Palace Hotel, in San Francisco, January 12th, under the auspices of the Electrical Development League.

The occasion was the weekly luncheon of the league, and an unusually large attendance was in honor of R. H. Ballard, of Los Angeles, and John A. Britton, of San Francisco, who were about to undertake a trip east to spread the propaganda of the West among the leaders of the electrical industry on the Atlantic seaboard. Mr. Ballard enjoys the distinction of being the first Californian elected to the presidency of the National Electric Light Association, while John A. Britton serves the association in the capacity of chairman of the public policy committee. Their trip east has for its main purpose the conclusion of preparations for the annual national convention of the association, which takes place in Pasadena May 18th-22nd. Some idea of the importance of the convention may be gathered from the announcement that it will number upwards of three thousand delegates, including all the leading lights of the electrical industry in the country, besides representatives of the big financial houses that deal largely with public utility securities. A conservative estimate of the invested capital represented at this convention would be in the neighborhood of three billions of dollars.

The idea of a message from the West to the East, then, was a happy one for this gathering, and it was featured in unusual style through an address by Robert Sibley, editor of the Journal of Electricity, who presented facts and figures to show that in nearly every line of endeavor the Pacific Slope has done more in actual accomplishment, particularly in pioneering, than any other section of this great country. Mr. Sibley showed, for instance, that whereas the West represents but eight per cent of the total population of the United States, yet in water power development it is a long way in the lead. It leads, also, in the consumption of kilowatt-hours per capita, and this in the enormous proportion of three to one; while in the way of potential development it commands no less than 36,000,000 horsepower out of a total in the United States of 51,000,000.

In accomplishment today western enterprise presents some records worthy of considerable consideration. One instance is furnished by the combination of electric service facilities afforded by the systems of the Pacific Gas and Electric Company, Great Western Power Company and the Sierra and San Francisco Power Company. This pool, as it were, of the electric product was ordered by the power administrator in the service of the California State Railroad Commission early last year, and the record showed an aggregate of a billion and a half kilowatt-hours for last year. This, according to charts produced by Mr. Sibley, showed the western combine leading all others in the country, exceeding in output even the Edison Commonwealth of Chicago, long recognized as the greatest power generating public service concern.

Another point dwelt on by Mr. Sibley was the interconnection of electric transmission lines which, so far, has joined the power sources lying in the Cascade Mountains of Oregon with the Bay of San Francisco, and with the shortly to be completed line connecting the Pacific Gas and Electric Company's service in the San Joaquin Valley with the northern portion of the San Joaquin Light and Power Company's system will eventually form an unbroken chain of electric transmission reaching from the Oregon mountains to the Mexican border.

Many installations worthy of notice the lecturer showed. Prominent among these were the 18,000 horsepower turbine in the Wise power house near Auburn, the property of the Pacific Gas and Electric Company, known to the electrical world as the largest single discharge turbine in existence, and the South Tower, on the heights above Port Costa, where the Pacific Gas and Electric Company's lines across Carquinez Straits by overhead cable. This is known as the second largest cable span in the world. The Great Western Power Company's power cable under San Francisco Bay, three and one-half miles in length, was brought forward as the longest of its kind in the world; the Big Creek plant of the Southern California Edison Company was exhibited as the transmitting end of the longest up-to-date single transmission system in the world, whereby electricity is sent into the city of Los Angeles, a distance of 250 miles, under a propelling force of 150,000 volts.

Editor Sibley showed various reclamation and irrigation pictures. He showed some notable achievements in the way of dams, notably, the Elephant Butte dam in New Mexico and the Roosevelt dam in Arizona. The Calaveras dam of the Spring Valley Water Company, now under process of construction, was instanced as the largest earth-filled dam, when completed, in the world. The highest rock-filled dam in the world is in San Diego County, and the highest dam of any kind also belongs to a Pacific Coast State, namely, the Arrow Rock dam in Idaho, 347 feet above the stream bed. Pictures of gold-dredging, an industry more successfully prosecuted in California than elsewhere, were shown; views of the Hetch-Hetchy Valley water and electrical development projects; the electrically equipped camps in the Yosemite Valley; the electrified roads of the Chicago, Milwaukee and St. Paul system in the Northwest; the University of California with its 9,600 students; three or four of the greatest men in the eye of the public just now, with Hoover at their head.

All these were featured by Editor Sibley in his address upon what he called "The Great Vision of the West." He closed a most interesting talk with a recommendation upon the point of "self interest," showing how it was the duty of the present-day developer to show to the people generally how their interest, as well as, if not more than, his own, are involved in the success of his enterprise. He quoted, in conclusion, the words of St. Paul: "Let us watch and be thoughtful."

John A. Britton introduced Robert Sibley in happy fashion. John B. Miller, chairman of the board of directors of the Southern California Edison Company, in responding to the call for an address, spoke upon public sentiment, and urged upon his hearers the necessity for understanding that the success of a public service enterprise must go hand in



hand with favorable public opinion and that every energy should be bent in securing that favorable opinion in a thorough, honest, businesslike and straightforward way.

Mr. Ballard closed the speaking with a few words under the heading "Everybody Works." It was the business of the electrical men of the West, he urged, to make the production equal to the demand, and until the day came when that aim should have been accomplished it was useless, he thought, to expect a reduction in the muchly complained of high cost of living. As for the great convention to be held in Pasa-

dena in May, it would be necessary for all present, nay, for every member of the electrical industry in California, to constitute himself an integral part of the campaign of promotion, in order that as in vision and accomplishment the West already leads the world, so it might hand down to history the greatest and most notable gathering of electrical men ever held anywhere on the earth's surface.

The meeting closed with a hearty "au revoir" to Ballard and Britton. Ballard left the following morning for New York. Britton expects to follow him in a few days.

## HAPPENINGS IN THE INDUSTRY

### COMMISSION HEARING

At a hearing held before the California State Railroad Commission at Fresno, California, on Jan. 5th, 1920, before Commissioner Delvin in the matter of wage increases of the San Joaquin Light and Power Company, Senator L. H. Roseberry, in charge of the trust department of the Security Trust and Savings Bank of Los Angeles, stated that during the past year savings banks mortgages on real estate had been either greatly amortized or paid off and that now savings banks were in the field for new investments. The public utilities security is one of natural attraction to bankers, but due to the history of public utilities to some extent it has been not in high favor with savings banks that seek a very stabilized security as well as a good fair rate of interest, that being due probably to the history of some public utility that led them to be so regarded rather than their present condition.

The present situation is that regulation by public service commissions has solved the problem as far as the investor is concerned. The commission stands between the consumer and the producer, as he termed it, and insures enough security and fairness to both sides to stabilize the business itself. Those who own securities of the hydroelectric power companies want to know that the industry is going to be put on a permanent basis, both as to the maintenance of its present equipment as well as the encouragement of its equipment to meet advance demands of the community in which it is operating and to develop that community so as to create a fixed demand for its commodities and continuing fixed demand.

If capital can secure the same security and a greater rate of interest from other enterprises it will naturally not flow to public utilities. So in order to develop a public utility there has to be a reasonable attraction to it, at least from the investor's standpoint. Unless the public utility is encouraged and can draw sufficient capital to stabilize its business and provide for extensions and improvements, the consumers cannot expect to get a permanency of service nor extension of it.

California banks are loaning very heavily in the agricultural communities for the development of farm lands and this land depends largely upon the furnishing of hydroelectric power for irrigation purposes. And if there is an assurance that the supply of hydroelectric energy will be sufficient to meet the demand the banks will naturally go behind the loans on the land quicker than they would without that assurance. They will also purchase the securities of the public utilities themselves more readily if that factor is satisfied, and they will advise their clients to do likewise.

The most important single factor is therefore the sustained continuous earning of a public utility sufficient to enable it to meet all of its financial requirements for development and to provide for development of the plant.

Cyrus Pierce, president of Cyrus Pierce & Company,

dealers in bonds, and investment bankers, stated as follows:

"Due to the fact that street railway systems of the country have sustained severe financial setbacks, the securities of public utilities in general have not met with a popular appeal, as the public considers a street railway and other public utilities in the same category. However, the discriminating investor and the banker easily and understandingly differentiate between the troubles that exist with reference to street car utilities and utilities of another character. But the rank and file of investors do not stop so to discriminate.

"It is the duty of the bond houses to make a careful analysis and see whether the security is behind the various financing schemes proposed and then to buy securities with their own money and afterwards distribute it to the small investor, giving to him the more responsibility of the bond house in addition to the security of the public utility.

Mr. Pierce's institution thought that not less than \$250,000,000 would be necessary to meet the demands of the hydroelectric companies in California during the next ten years and they considered that those figures are very conservative. It was his opinion that it was to the greater interest of the people of the State of California to see that power was properly developed, rather than to quibble over a difference of one-tenth or two-tenths cents in the price of the commodity at the present time. Mr. Pierce continued:

"At least 33 per cent of the money necessary must be obtained by the sale of junior securities such as preferred stock and securities of that kind where there is an ownership interest rather than a creditor's interest.

"The tremendous San Joaquin Valley of California is now only about 20 per cent developed and the other 80 per cent is absolutely dependent on hydroelectric power and nothing else. And if the companies do not get the necessary money for development the vast San Joaquin Valley will remain untouched.

"There is one thing which must be realized and that is that there is nothing sacred about money. It is a commodity which will flow where the highest price is obtainable.

"I think the dictum of the California State Railroad Commission given at the beginning of the war to the effect that the corporations of California shall be kept solvent has done more to attract the attention of the investors to California securities than any other one act of which I know.

Regulation necessarily implies preservation but some commissions regulate and do not preserve. Commissioner Devlin stated that the California State Railroad Commission was now equipped properly to supervise with reasonable accuracy the expenditures of the public utilities of the state and see if the expenditures made had the equivalent return in the property, and the commission keep in sufficient touch with these utilities to see that the work rendered by the utilities or for the utilities approximate in efficiency that of any other similar line of business.

### NATIONAL ELECTRIC LIGHT ASSOCIATION EDUCATIONAL COURSES

The Educational Courses which were arranged by the Commercial Section of the National Electric Light Association, and which cover Practical Electricity, Commercial Engineering, Elementary Accounting and Advanced Accounting, were offered to the employes of the Southern California Edison Company during the early part of the present winter. At the present time there are approximately three hundred of the employes enrolled as follows: 280 in Practical Electricity, 8 in Commercial Engineering, 10 in Elementary Accounting, and 2 in Advanced Accounting.

These courses, while designed as correspondence courses, and which can be successfully carried on as such, with a



great deal of benefit to the student, are being supplemented by classes by this company. Already classes have been held in several of the districts with an attendance of from twenty-five to seventy-five, depending upon the size of the district.

At these meetings, demonstrations of the principles and theories covered by the instruction book are performed, and where necessary such theories are elaborated upon. Following this a general discussion is held, which offers the students an opportunity to ask questions regarding principles that have not been made sufficiently clear by the instructions given. It is believed that the effectiveness of the course is greatly increased by such meetings and discussion.

The courses as arranged consist of from ten to fifteen lessons, and it is proposed to hold a meeting in each district for the discussion of each lesson.

In the promotion of this work, it was found advantageous and effective to invite all of the employes in a district to the first meeting, in order that they might gain a better idea of the purpose and worth of the course. The enrollment in one of the districts was more than doubled following the initial meeting.

The courses are in charge of F. B. Lewis, superintendent of the Los Angeles district, Southern California Edison Company.

#### FIXING A WAGE SCALE IN FRESNO

The members of the joint board, consisting of five representatives appointed by the Building Trades Council of Fresno, and five representatives of the Building Industries Association of Fresno, which met on December 19, 1919, submitted a report to their respective organizations, from which the following is extracted:

##### 1. The wage scale will be:

Bricklayers .....	\$10.00	Carpenters .....	8.50
Plasterers .....	10.00	Painters .....	8.50
Cement Finishers .....	9.00	Glaziers .....	8.00
Plumbers .....	9.25	Millmen, Sash and Doors .....	7.00
Steamfitters .....	9.25	Millmen, Benchmen .....	7.50
Electricians .....	9.25	Millmen, Foremen .....	8.50
Iron Workers .....	9.00	Hod Carriers, Plaster .....	8.00
Sheet Metal Workers .....	9.00	Hod Carriers, Brick .....	7.00
Lathers .....	9.00	Cement Workers .....	7.00
Roofers .....	8.00	Teamsters .....	6.00
Engineers .....	8.00	Common Laborers .....	5.50

The above scale will become effective January 1st, 1920, with the exception, that in the case of such unions as have been granted this scale by the Building Trades Council, subject to the usual ninety days notice, the scale will become effective at the expiration of the ninety days.

2. No future increase (after January 1st, 1920) will be asked by any union nor granted by the Building Trades Council, excepting in the event that an increase of ten per cent occurs in the cost of living from and after October 13th, 1919, whereupon an increase of fifty cents per day for each craft will automatically be granted, and successive increases of fifty cents per day for each and every subsequent increase of ten per cent in the cost of living, will continue to be granted thereafter.

The statistics prepared and reports issued by the U. S. Secretary of Labor will be the only evidence presented or considered as proof of increase of living cost. These reports will be presented to and considered by this joint wage adjustment board, and their action will be final in declaring an increase. Any increase so declared will become effective on the second Monday following the declaration of the same by the Board.

3. In the event of any raise after January 1st, 1920, all contractors or sub-contractors who have legitimate contracts on hand, and who have filed memo of such contracts with this Board prior to the declaration of increase in scale, will be reimbursed by each local union furnishing men for the work affected, in the full amount of the actual additional labor cost resulting from the said increase. No contractor or sub-contractor will be protected on contract work who has not filed memorandum of contract with this Board prior to declaration of increase. The decision of this Board will be final as to the legitimacy of contracts filed, and it will have the power to require and consider evidence in any instance in question.

This Board will not grant reimbursement to any contractor or sub-contractor who is not a member or associate member of the Building Industries Association.

This report, if ratified by all local unions and by the association, will constitute a working agreement covering the method of increasing wages during the year 1920, and the method of protecting contractors during said period, and the agreement will be considered executed when the Board has received formal written notice from each organization, through its secretary, that the said organization has ratified this report.

#### LICENSING OF ENGINEERS

The fifteen members of the committee on licensing engineers as appointed by the Engineering Council, were selected from thirteen states, viz: Connecticut, New York, Pennsylvania, Ohio, Georgia, Louisiana, Illinois, Missouri, Iowa, Min-

nesota, Colorado, California and Washington, and therefore represent practically all sections of the United States, as well as mechanical, electrical, mining, hydraulic, municipal, sanitary, railway and structural engineering, and also college of engineering.

The report of the committee runs in part as follows:

The first work of the committee was to investigate the general subject and to collect, so far as possible, available material bearing upon the subject in hand, including opinions from many engineers as to the need or desirability of legislation, as well as copies of all state laws passed and proposed, having to do with licensing or registration of engineers, architects and surveyors.

This preliminary investigation disclosed that very pronounced views were held by engineers throughout the country, both for and against state licensing or registration. The general sentiment one year ago was more opposed to such measures than it is today. The older members of the profession did not as a rule favor licensing nor did they feel there was need for state regulation of engineering practice, while among the younger men there was a feeling that licensing or registration by the states would add prestige to professional engineers and in many ways benefit the profession, as well as individual engineers.

The advantages claimed for state licensing or registration are the same as those presumably gained by the laws regulating the professions of law and medicine, namely, that those who are incompetent and unqualified professionally to practice are unable to obtain certificates or licenses and hence both the public and the profession are protected. On the other hand, those engineers who have already attained to recognized professional standing feel, they not only do not need the benefits claimed for such legislation, but they fear that state licenses or certificates of registration are apt to put the seal of state endorsement on men who do not deserve it and that the public would assume that a licensed or registered engineer was thereby certified by the state as fully qualified, regardless of what might or might not be the requirements demanded before a license or certificate was granted.

However, the question has gone beyond the stage of debate, for already ten states\* have enacted laws licensing or registering engineers, and other states are certain to enact similar laws during the present or coming sessions of their legislatures. In addition to these ten laws governing engineering practice, there are at least six states that require the licensing or registration of land surveyors and in at least eighteen states\*\* laws have been passed licensing or registering architects. Some of these ten laws are so drawn as to include both engineers and surveyors and some include engineers and architects and one or two include engineers, architects and surveyors. Moreover, these laws are not at all uniform and in several instances are likely to prove seriously embarrassing and annoying to engineers whose activities extend beyond the limits of a single state. Because of the nature of professional engineering work the practice of an engineer frequently extends over several states and therefore it is vitally important, if there are to be state regulations for engineering practice that these regulations be made uniform so far as possible and that the engineering profession unites in wisely directing such legislation.

This committee has made a very careful study of definitions for "engineer," "engineering," "architect" and "architecture," but it was found that any definitions for engineering would be so general as to include too much, or too specific to be sufficiently general, or too voluminous to be suitable to incorporate in a law. Some have endeavored to include in a definition of "engineering practice" all sorts and kinds of construction work, but engineering includes investigations as well as plans and no catalogue can well be prepared sufficiently detailed to include all sorts of engineering activities.

The only basis on which the practice of any profession may be subject legally to state regulation is "in order to safeguard life, health and property." The state may not dictate that no one without a particular kind of artistic talent nor without a tenor voice may practice engineering or architecture, but it may legally require that no one shall practice architecture or engineering that is ignorant of the effects of loads and applied forces or incapable of determining the stresses in structures due to loads and applied forces and unable properly to proportion materials in structures to safely sustain such loads and forces.

This committee has deemed it advisable and to the best interests of all concerned to include in one law, provisions for the registration of engineers, architects and land surveyors. It has recognized that the practices of engineering and architecture overlap in many instances, especially in connection with the larger projects of modern structures, where many branches of the arts and sciences are combined, involving architecture, structural, mechanical, electrical, sanitary, and other lines of engineering.

In fixing the qualifications for registration in our proposed bill, these have been purposely made high, but they have not been made unnecessarily difficult for reasonably competent men to meet. It is not intended that candidates would ordinarily be subjected to written examinations, but rather that the board of registration would pass upon the sufficiency of the professional record of each candidate. Minimum qualifications have been clearly set forth which must be met. In order to enable the board to pass upon candidates fairly, certain qualifications are specified as "prima facie evidence of fitness" which (unless other facts derogatory to a candidate are also in evidence) will permit the board to pass the candidate. This so-called "prima facie evidence" is not required, but if the candidate can present such evidence his application is the more readily passed upon. For instance, a candidate need not be a graduate of a college of engineering or architecture, but if he is, it is to his advantage. Likewise a candidate need not be a full member of one of the national technical societies or institutes, but if he has won such full membership it is greatly to his professional advantage.

The committee unanimously approved the bill as sent out with minor suggestions for guidance in the final editing. This editing is now completed and the bill is submitted to Council, with report and recommendation that Council approve and endorse the same as a bill for an act of legislation in each and every state, for the regulation of the practice of engineering, architecture and land surveying.

\*Colorado, Florida, Idaho, Illinois, Iowa, Louisiana, Michigan, Nevada, Oregon, and Wyoming.

\*\*California, Colorado, Florida, Idaho, Illinois, Louisiana, Michigan, Montana, New Jersey, New York, North Carolina, North Dakota, Oregon, Pennsylvania, South Carolina, Utah, Washington, and Wisconsin.



## THE STANDARDIZED ACCOUNTING SYSTEM

In beginning a new set of books, as many contractors and dealers now are doing, the opportunity should not be overlooked of adopting the standard accounting system worked out by the National Association of Electrical Contractors and Dealers. Subscriptions for this system may at any time be entered with the secretary of your State Association, to whom checks should be made out for transmittal to the National Association. It should be noted that a special price of twenty-five dollars, express collect, is accorded to association members, the cost to others being forty dollars.

The Journal of Electricity has in preparation a series of fifteen articles to deal with elementary principles of bookkeeping as related to the accounting system here recommended. The series is being arranged in cooperation with the Extension Division of the University of California, the articles appearing in the Journal to serve as one of the texts for the course of study involved. This is one of the most far-reaching enterprises in which the Journal of Electricity has ever been engaged, and further announcement will be made thereon in later issues.

## APPROVAL OF PUBLIC UTILITY LEASE

"The lease is distinctly in the interest of the public," declares the Railroad Commission in an order issued recently approving the lease by the Sierra & San Francisco Power Company of its properties to the Pacific Gas & Electric Company. The lease is to run for a period of fifteen years, dating from January 1, 1920. In addition to paying all taxes and governmental charges, providing for special funds created by the lease and setting aside 2 per cent of the gross revenues received from the leased properties for depreciation the gas company is to pay a rental of \$50,000 a year for two years, \$100,000 for the third and \$150,000 for each of the remaining years of the lease.

Commissioner Irving Martin, who wrote the opinion accompanying the order of approval, calls attention to service improvements that will follow as a result of the lease. He says:

"Considerable preliminary work has been done towards the installation of the so-called 'Spring Gap plant' on the Stanislaus River. Material has been ordered for a second transmission circuit from Port Marion to Salinas in order to improve the service conditions in Salinas and other territory served by the Coast Valleys Gas & Electric Company which buys its energy from the Sierra company. Material has also been ordered to strengthen the line from Manteca to Modesto, thence interconnecting from Modesto to Newman, with provisions for an additional line to Turlock. Work has already been started by the Sierra company on an additional pipe line to its Stanislaus plant. The estimated cost of these projects is in excess of \$1,000,000."

The Sierra & San Francisco Power Company sells and distributes water in Tuolumne County and electric energy in the "Mother Lode District" of Tuolumne and Calaveras counties; in Stanislaus, San Joaquin, Contra Costa, Alameda, Santa Clara, San Benito and Monterey counties and the city of San Francisco. It supplies power to the United Railroads of San Francisco, 62 per cent of its earnings from the sale of electricity coming from the street railroad company.

## SUPREME COURT UPHOLDS DECISION OF CALIFORNIA RAILROAD COMMISSION

Upholding the jurisdiction of the California Railroad Commission over wholesale public utility rates the United States Supreme Court on January 19th, established a precedent for all utility commissions throughout the country. The case on which the decision was handed down, that of the Napa Valley Electric Company, was regarded as a test case by all utility commissions.

The California Light & Telephone Company applied to the Railroad Commission to have the commission fix the rate for the wholesale service energy supplied to it by the Napa Valley company. The California company retails the service to consumers in and about Calistoga. The Napa Valley company opposed the application, claiming that the commission had no jurisdiction over the rate for this wholesale service, which was supplied under a contract between the two companies. The Railroad Commission held that it had jurisdiction over wholesale utility rates and this decision of the commission was taken to the courts by the Napa Valley company.

The decision of the United States Supreme Court upholds the decision previously rendered in California by Judge Van Fleet, sustaining the jurisdiction of the Railroad Commission.

The case was argued before the United States Supreme Court December 9 by Attorney Douglas Brookman for the commission.

## MAJESTIC ELECTRIC DEVELOPMENT COMPANY

The board of directors of the Majestic Electric Development Company met in San Francisco on January 13th and elected officers for the coming year. Those chosen were: E. N. Brown, president; M. H. Shoenberg, vice-president; T. D. MacMullen, secretary and sales manager. An increase of business of 300% over the preceding year was announced for 1919. No change of policy has been planned for 1920.

## TRADE NOTES

### New Installations —

The Detroit Electric Steel Furnace Company is furnishing the Oregon Brass Works of Portland, Oregon, two electric furnaces. The West Coast Electric Company is making the electric installation. Cost approximately \$20,000.

A. E. Meserve is installing the electric work in the new Herbert Gordon building, 285 Stark Street, Portland.

Jaggard-Sroufe Company are installing the electric work in the Mitchell, Lewis & Staver building, Portland, Oregon.

### New Electrical Store —

A new electric shop, under the name of Wolff Electric Works, has opened up at 65 North Ninth Street, Portland, Oregon, specializing in rewinding and repair work.

### Changes in Equipment —

Vanderlipp & Lord are making extensive changes in the electric equipment of the Liberty Theater, Portland, Oregon.

### Manufacturing Equipment —

The Big-Four Electric Company, of Tacoma, Wash., is now equipped to manufacture domestic tank heaters, electric steam generators, hot water circulating boilers, air heaters, and pipeless electric furnaces. They have delivered 100 heaters to the City of Tacoma.

### New Agencies —

The Coast Equipment Company, with offices in the Merchants Exchange Bldg., San Francisco, and San Fernando Bldg., Los Angeles, has been appointed exclusive sales agent for California and Nevada for the following companies: Ridgway Dynamo & Engine Co., Ridgway, Pa., manufacturing turbo-generator sets, alternating and direct-current generators, motor-generator sets, steam-engines, synchronous motors. Pittsburgh Transformer Co., Pittsburgh, Pa., transformers. The Atlas Car & Manufacturing Co., Cleveland, Ohio, electric storage-battery and trolley locomotives, storage battery flat-cars and industrial cars. Norwalk Iron Works Co., South Norwalk, Conn., air, oxygen, hydrogen and carbonic-acid gas compressors, and automatic ammonia compressors. Duncan Electric Manufacturing Co., Lafayette, Indiana, watt-hour meters.



**Sales Force Increased —**

The Central States Electric Company, Fresno, under the management of Klein L. Smith, now has five outside salesmen—four on washing machines and one on general appliances.

**Dealers' Meeting —**

A meeting of Blue Bird electric washing machine dealers of the San Joaquin Valley, held at Fresno on January 19, was addressed by G. W. McNichols, who has recently come from St. Louis to take charge of one of the Blue Bird stores in San Francisco.

**New Firm —**

Curry & Will, Inc., is the name of a new firm going into the electrical business in Forest Grove, Ore.

**Expansion of Industrial Electric Heating Department —**

The Cutler Hammer Mfg. Co. is now devoting new floor space to the Industrial Electric Heating Dept. This is in addition to the space formerly used for manufacturing household electric appliances such as irons, toasters, table stoves, etc., which have been discontinued. The industrial heating line which now is being expanded, includes such well known products as the electric space heater, soldering iron, linotype pot heaters, metal melting pot, chocolate warmers for candy factories, immersion water heater, circulation water heater, tailors' irons and heater units for application to all types of machinery.

**Foreign Contract —**

Stone & Webster, construction engineers, have recently been advised by cable of their selection by the Kiso Electrical & Industrial Company, Ltd., to supervise the design and construction of a 30,000 hp. hydroelectric development near Nagoya, Japan.

**New Office —**

The Coast Equipment Company, industrial engineers of San Francisco, have opened an office in the San Fernando Building, Los Angeles, in charge of Ralph B. Clapp. Mr. Clapp is president of the Electrical Cooperative League of Southern California.

**Underwriters' Approval —**

The Economy Fuse & Manufacturing Company, of Chicago, announce the approval by the Underwriters' Laboratories of Economy Renewable Fuses in all capacities.

**PERPETUAL MOTION DELUSIONS****A letter to the Editor**

In a paper before the International Electrical Congress I stated in effect "that with the use of water power which nature replenished, and the distribution of this power by means of the electrical system, the curve of human efficiency would tend to become asymptotic to the line representing 100 per cent." Which means that I believe the human being has set before him certain definite limitations which can never be overcome.

The Editor of the Journal of Electricity in an editorial said, that it took a bold man indeed to set a limit to human progress, and stated in effect that progress may go on indefinitely. (I leave it to others as to whether I was bolder for setting a limit than the editor who said there is no limit.)

The remarkable progress in science and its application in the last fifty years has been truly remarkable and almost staggering, especially staggering to the ordinary human with little knowledge of fundamental natural laws. Men often say to me "anything is possible," and I answer decidedly not, and for example I say, "try to give birth to a child."

Nature's laws are fixed and unchangeable. The law of the conservation of energy is as certain on this earth, as the daily cyclic "rise and fall of the sun." If this simple law, which says in effect that the sun of energy of the universe cannot be increased, were generally known there would be little opportunity for the fake perpetual motion schemes

that in one way or another crop up periodically. And the surprising thing about these schemes for "lifting oneself by one's bootstraps" is the number of ordinarily intelligent people who believe in them. I have had occasion to come in contact with a number of these fake schemes and schemers.

In one case a certain man collected many thousands of dollars over a period of about ten years from lawyers, doctors and business men, to perfect a scheme by which one horsepower could be multiplied by two. In trying to show the "faker" how absurd his scheme was, I said to him, "If you can multiply one horsepower by two, you can then multiply the two into four, and then the four into eight and go on increasing the amount indefinitely." He said, "Exactly." Then I said: "You can then really start with an infinitesimal amount of power and keep on multiplying it so as to run the universe, starting with nothing whatever." He said: "Exactly." I told him then to get out of the office as fast as he could.

He reported to his "clients" or "suckers" that I was consulting engineer for the power company and I, of course, did not want their business to be thrown in the discard.

The surprising thing is that the lawyers, doctors, and business men believed that to be the case, and so far as I know this man is still collecting money from them.

But can we blame lawyers, doctors, etc., who should of course know better, when even engineers believe in such schemes? A practising consulting civil engineer came to me a few years ago and wanted me to join him to help finance an inventor whose scheme was not only to burn nitrogen in a furnace but continually to reburn the same nitrogen over and over, using no gas or oxygen.

Now an engineer who does not believe in the law of the conservation of energy is about as reliable as a ship captain who insisted on sailing his ship on the theory that the earth is flat.

Civil and mining engineers are occasionally deluded with such schemes because they have not a thorough understanding of the fundamentals of power. Electrical and mechanical engineers are seldom deluded, because they are generally well grounded in the fundamentals of power.

Wireless transmission of electric waves was known before the modern system of electric power and transmission of power were known, and the latter is an improvement of the transmission of electric waves through the air and not vice versa, as is generally supposed. Yet many people believe that wireless transmission of power will some day supersede the modern power and transmission systems. It is of course possible to transmit power through the air but the results must be at an infinitesimal efficiency, compared to power transmission over ordinary power wires. We can also transmit merchandise packages through the air by means of tubes, etc., but the resulting efficiency must be extremely small compared to modern railroad transportation. Power out of the air by the windmill is possible but inefficient and intermittent.

The idea that a great many people have that the aeroplane may some day replace the railroads for economical movement of tonnage is absurd of course. Yet some people in fear sell their railroad stock.

A banker who believed that money could be manufactured and thus double and treble the wealth of the world by simply operating a printing press would be a fit subject for the insane asylum or the penitentiary, if not already there. But such a man is the sanest of the sane compared to the men who believe in perpetual motion schemes, or who do not believe in the law of conservation of energy.

Power must always be generated, transmitted and utilized on this earth at less than 100 per cent efficiency; of that we are more certain than death. We can only strive to reduce the losses and get as near 100 per cent as economically possible.



## NEW ELECTRICAL DEVELOPMENT

(A great number of applications for water for developing power are indicative of activities in the Northwest. The Pacific Central district has under way important electrical undertakings connected with terminals and city lighting systems. In the Pacific Southwest and the Inter-mountain district railroad electrification and extensive hydroelectric power developments are conspicuous.—The Editor.)

### THE PACIFIC NORTHWEST

**SEATTLE, WASH.**—Five-cent fares are to remain on Seattle's municipal street car system, the city council has ruled.

**SPOKANE, WASH.**—The Electric Element Corporation has been incorporated at this place for \$200,000 by L. C. Jesseph, C. I. Hodges and W. W. Zant.

**YAKIMA, WASH.**—The Electric Power & Appliance Company has been incorporated for \$25,000 by Albert Schroeder, C. H. Kirby and Arthur L. Fullbright.

**SEATTLE, WASH.**—The General Electric Company was awarded the contract on a bid of \$6,655.12 for furnishing the city with oil switches for the use of the lighting department.

**SEATTLE, WASH.**—Saxe & Hussey, 315 Pine street, Seattle, are installing an electrical kitchen in the Scottish Rite temple at Broadway and Harvard avenue, consisting of range, steam table, dish washer and coffee urn.

**SEATTLE, WASH.**—The Allis-Chalmers Manufacturing Company has been awarded a contract by the Board of Public Works of Seattle for furnishing four transformers for the lighting department at \$30,000.

**SEATTLE, WASH.**—Saxe & Hussey, 315 Pine street, Seattle, report considerable activity in the export department of their business. Among the recent orders placed was one for a consignment of vacuum cleaners to be shipped to Shanghai, China.

**TACOMA, WASH.**—Allis-Chalmers Manufacturing Company, Seattle, recently sold to the St. Paul & Tacoma Lumber Company, Tacoma, five electric motors which will be used for operating the woodworking machinery in its new mill.

**SEATTLE, WASH.**—The city engineer has presented plans for tunneling Renton Hill from Leschi Park to 22nd avenue and Jackson street and Third avenue from Stewart street to Jackson street, for subways which would cost the city \$7,436,350.

**SCIO, ORE.**—The city of Scio, Linn county, Oregon, has been issued a permit to take 47 second feet of water from the Thomas Creek, a tributary of the Santiam river, for light, power and pumping purposes. Cost of dam, headgate and flume, \$38,427.

**SEATTLE, WASH.**—The Board of Public Works approved the recommendation of Superintendent of Lighting J. D. Ross for furnishing a 50-ton overhead traveling crane for use at the Cedar Falls power house extension of the city lighting plant, estimated cost \$6,000.

**CENTRALIA, WASH.**—President P. W. Kane of the Kane Pneumatic Shock Absorber Company is formulating a plan for the installation of a 500-kw. power plant on Fords prairie, west of here, to furnish current to the Kane factory, being erected on the prairie, and other industries.

**TACOMA, WASH.**—Sealed proposals will be received at the office of Commissioner of Light and Water, Room 403, City Hall, between noon and 2 p.m. February 3, 1920, for furnishing necessary machinery, equipment and materials for a lighting feeder switchboard at the Nisqually power plant, 25th street substation. A bond for 25 per cent of the bid is required, payment to be made in warrants.

**WASCO, ORE.**—Homer S. Wall of this place has filed an application with the state engineer for the appropriation of 500 second feet of

water from John Day river for the development of 600 horsepower near Early, Oregon. He will construct a concrete head gate and canal 20 feet wide and install a turbine water wheel. The dam has been completed. The construction on the remainder of the work is to be started by April 1, 1920; approximate cost, \$57,150.

**SEATTLE, WASH.**—NePage, McKenny Company, electrical engineers, contractors and manufacturers, Armour Building, Seattle, have been awarded a contract for the complete electrical equipment in Pantages theater at Memphis, Tennessee, including border lights, stage lighting, footlights, strip lights and other necessary lighting facilities incident to modern theater illumination. The company has started electrical work in St. Joseph's hospital at Aberdeen, Washington. The job is to be complete, including light, power and nurse call system.

**SEATTLE, WASH.**—In his report to the mayor, transmitted by that official to the city council, Superintendent of Lighting J. D. Ross asks for \$1,750,000 for completion of Cedar Falls power plant to a capacity of 18,000 kilowatts. He estimates the cost of Cedar Falls plant at \$3,500,946.66. The sealing of the new dam has cost to date \$381,814.07. The completion of the penstock and the installation of a new generator will add \$600,000 to the cost of the plant.

**SEATTLE, WASH.**—The city is to build 23 miles of railway from Rockport to and up the Skagit river to Gorge Creek for the purpose of delivering the materials needed in the construction of the Skagit river hydroelectric power project. The Board of Public Works has authorized the purchase of 2,665 tons of 65-lb. rails from the Great Northern Railway at \$45 per ton, f.o.b. Rockport. This sum of \$120,000 is to cover the rails alone. The city is to get out the ties and necessary timber, the railroad bed to be graded through to the dam.

**SALEM, ORE.**—Six applications, each for 3,700 second feet of water from the Deschutes river, for developing power, have been filed by Frank F. Lischke of Milwaukie, Oregon, in the office of the state engineer. The appropriation asked for is to be used for developing power at different places: Application No. 7005, for diversion at Metolius power site in Jefferson county; No. 7009, for White Horse Rapids power site in Wasco and Sherman counties; No. 7007, for Coleman power site in Jefferson county; No. 7008, for Mecca power site in Jefferson county; No. 7008, for White Horse Rapids power site in Wasco and Sherman counties, and No. 7010 for Pelton power site in Jefferson county.

**PORTLAND, ORE.**—Sealed proposals will be received by the Oregon State Highway Commission up to February 5, 1920, at 10 a.m., at Room 520, Multnomah county court house, for construction of a double-leaf trunnion bascule bridge with approaches and appurtenant works on the Columbia river highway across Young's Bay in Clatsop county, near Astoria. Requirements are for 75,000 pounds of reinforcing steel, 470,000 pounds of structural steel, 65,000 pounds of machinery, with miscellaneous electrical and other equipment. Bids must be accompanied by a cash bidder's bond or certified check for an amount equal to at least five per cent of the total amount bid. Plans can be obtained from the State Highway Commission or State Highway Engineer, Salem, upon the deposit of \$10.

**SPOKANE, WASH.**—Reorganization of the bankrupt Spokane and Inland Empire railway system was made known with the filing at Spokane of articles of incorporation for the Spokane & Eastern Railway & Power Company and the Inland Empire Railroad Company, the former being capitalized for \$3,000,000 and the latter for \$1,000,000. The Inland Empire Railroad Company will operate the present "Inland division" of the company, comprising interurban lines to Moscow, Idaho and Colfax, Washington. The other company will operate other property of the concern, including the city street car system in Spokane, the Coeur d'Alene, Idaho, interurban line and the power plant. The property was recently purchased by the bondholders at receiver's sale. F. E. Connors, receiver, and Waldo G. Paine, traffic manager, are named as incorporators.

**SEATTLE, WASH.**—Expenditures totaling \$1,737,234 would be required to carry out a program for the betterment and extension of the municipal street railway system during the year 1920, is what Superintendent Thomas F. Murphine proposed to the city in a recent report to the Seattle city council. The plans include extensions and betterments of track, including reconstruction of the car lines on First avenue South, the purchase of new cars, remodeling of existing cars and the construction of a car barn in the vicinity of West Spokane street. For the track improvements and extensions Mr. Murphine proposes to expend \$663,234, exclusive of the First avenue South project, which he estimates will cost \$365,000. For new street cars he asks \$500,000 and \$150,000 for remodeling old cars into one-man cars. He estimates the cost of a car barn at Spokane street at \$60,000.

### THE PACIFIC CENTRAL DISTRICT

**FOLSOM, CAL.**—The Fair Oaks Irrigation District will, February 2, sell \$20,000 bonds.

**DAVIS, CAL.**—Plans for a complete new water system, separate from any now in existence, are being prepared for this city by Engineer T. R. Galloway.

**VALLEJO, CAL.**—Ground will be broken about the middle of February for the construction of a \$70,000 three-story structure for the Vallejo Electric Light and Power Company.

**MARYSVILLE, CAL.**—Marysville and Nevada Power and Water Company will, January 20, remove its offices from Marysville to Hobart Building, 582 Market Street, San Francisco.

**LOS BANOS, CAL.**—The city trustees decided to advertise for bids in the open market for the sale of the bond issue amounting to \$103,000, the money to be expended on the water system.

**MODESTO, CAL.**—Council-Application has been made by the De Yoe addition for water extensions and the matter was referred to the city engineer to make the connections, which will require 1000 feet of 2-inch pipe.

**OAKDALE, CAL.**—The Oakdale irrigation district board is ready to build Melones reservoir, according to statements made by F. H. Lee, secretary of the Water Storage Development Association. Estimated cost of the reservoir is \$1,690,000.

**PORTERVILLE, CAL.**—Geo. B. Sturgeon of San Francisco has been chosen for chief engineer of the construction to be started soon by the South Tule Independent Ditch Company, including a storage reservoir and a new distrib-



uting system through which to handle the water to which the irrigators are entitled from Tule river.

**RICHMOND, CAL.**—A vastly increased electric power has been made available through a "tie-in" accomplished recently by the Western States Gas and Electric Company, which serves Richmond, into the higher power line of the Pacific Gas and Electric Company.

The new line connects with the 60,000 volt line of the latter company in the San Pablo Valley. A camp has been established near San Pablo by the company, which has a number of men at work on the job. The completion of the work will require about ten days.

**VALLEJO, CAL.**—An allotment of \$47,500 was received by the Public Works Department on Mare Island for the electrification of the causeway and the construction of a number of electrified spurs to be used in handling the trans-continental freight shortly to be brought to the navy yard by car barges from the lower bay.

**WOODLAND, CAL.**—Plans for the formation of a new irrigation district are to be contained in articles of incorporation which will be filed with the Secretary of State in a few days by members of the newly organized Capay Valley Ditch Company. Directors of the company are M. H. Stitt, B. F. Gibson, C. A. Fein, James Schaffer and S. Gladney. James Houx is secretary.

**MANTECA, CAL.**—Six financial houses bid for the \$200,000 bond issue of the South San Joaquin irrigation district, but the Anglo-London and Paris National Bank of San Francisco offered the highest premium and received the entire award, at the meeting of the board, held to open and consider offers. The successful bank offered par and accrued interest, plus a premium of \$4,084.

**SAN FRANCISCO, CAL.**—Contracts for the outlet system of the Hetch-Hetchy reservoir estimated to amount to \$480,000, shortly will be let by the Board of Public Works. The first calls for six 47 x 90-in. steel slide gates, for which the estimated price is \$120,000 and for which bids will be received March 3. The second will be for six 33 x 42-in. slide gates, mostly bronze, for which the estimated price is \$139,000 and for which bids will be received March 24.

**HANFORD, CAL.**—President Hansen, Director A. H. Johnson and Secretary D. I. Drown of the Corcoran Irrigation District received sealed bids for the purchase of \$600,000 of six per cent bonds. The block was awarded to Leroy T. Ryone & Co., of San Francisco, at a premium of \$13,546.50. All construction bids were rejected as too high. A resolution was passed that the district should do the work with its own camps. Superintendent W. W. Atwater will have charge of construction.

**BERKELEY, CAL.**—Plans for the building of the first unit of the Pacific Port terminal on the Berkeley water front were filed recently with the city council by Attorney Stanley Smith, representing Rufus P. Jennings, promoter of the project, who now holds a lease on the water front property. Smith estimated that actual building operations would be started this year and that within the next five years at least \$1,175,000 will be spent on land leased from the city. A railroad from the adjoining main line railroad will be built.

**OAKDALE, CAL.**—Oakdale has decided to increase her lighting system by about 20 per cent, and twenty new lights will be added at once. The Trustees have decided to greatly increase the street system. No increases have been made for four years, while \$20,000 has been spent for other improvements in town. The Board also discussed the possibility of taking over the city system of lights, now owned by the Sierra and San Francisco Power Company. City Attorney Reeder declared, however, that the price put upon the system by the company at the rate hearing was prohibitive. There was also complaint on the part of the

Board over the present service, the lights themselves being very poor, it was claimed.

**AUBURN, CAL.**—The Pacific Gas and Electric Company has announced extensive improvements soon will be under way on its irrigating system between Auburn and Newcastle and south and east of Newcastle toward Folsom. District Manager H. M. Cooper says the company will spend several hundred thousand dollars the coming year, and that it may take two years to complete the work. The tunnel through Adams Hill, just below the Wise power house, will be enlarged and the main ditch increased in size. A number of lateral ditches will also be run. The water will be used to irrigate a fast-increasing orchard planting in that section. Already a large force of men is at work erecting camps and boarding houses on the Auburn-Newcastle road.

### THE PACIFIC SOUTHWEST

**LOS ANGELES, CAL.**—Fire demolished the Substation No. 44 of the Pacific Electric Railroad at Wilmington. Loss, \$7,500.

**MONROVIA, CAL.**—Klusman & Elsea have been awarded a contract for construction of a 2,500,000-gallon reservoir for the enlarged water system, at \$27,434, work to begin at once.

**SAFFORD, ARIZ.**—The San Carlos dam project is to be brought before the Government as one of the first units of construction after the enactment of the \$250,000,000 reclamation bill.

**LOS ANGELES, CAL.**—The Board of Public Works has awarded a contract to the Portland Cement Company for 5,000 bbls. of cement for use at No. 2 Power Plant and an option secured for 5,000 bbls. additional.

**LOS ANGELES, CAL.**—The Los Angeles Chamber of Commerce has been informed that the company formed to operate the International Dehydrator has placed an order for \$600,000 worth of new machinery, for a plant to be located in or near Los Angeles.

**PALMDALE, CAL.**—Palmdale and Little Rock bond issues for irrigation improvements carried at a recent election. Palmdale voted a bond issue of \$382,000 and Little Rock \$200,000. The two communities will combine in the construction of a dam in Little Rock Creek.

**PHOENIX, ARIZ.**—A contract has been entered into with the United States Reclamation Service in regard to the completion of the survey for its San Carlos dam project. W. W. Schneicht, the project manager at Yuma, represented the Government at the meeting of the State Land Board.

**LOS ANGELES, CAL.**—The first step toward the electrification of all the steam roads on the Coast was taken here with the announcement of a plan to install electric locomotives for switching service in the Los Angeles terminals of the Santa Fe, Salt Lake and Southern Pacific. Poles have already been erected on Alameda street to carry the high-voltage wires.

**SANTA BARBARA, CAL.**—In view of the completion of the dam, Montecito water users are speeding up their plans for buying water wholesale from the city. A new company has been organized as the Mountain Drive Mutual Water Company. Articles of incorporation will be filed at once. Plans for the proposed reservoir are under consideration. Montecito people must lay down their own high line from the city's surge chamber and install their own distributing system.

### THE INTER-MOUNTAIN DISTRICT

**DUBOIS, IDAHO.**—The city council has decided on a rate of 13c. per kilowatt-hour for lighting service in this community.

**DOWNY, ILL.**—This city is to have a new street lighting system to be installed in the early spring, to consist of sixteen 400-candle-power Type "C" units.

**SANTAQUIN, UTAH.**—This town is the latest in this section of the country to consider the installation of "White Way" lighting for its

business district. Prominent business men of the community are very much in favor of the plan and expect to have the installation made.

**BUTTE, MONT.**—Attorney-General S. C. Ford of Montana has ruled that irrigation bonds take precedence over state farm loans when both are liens against the same district, under state auspices.

**BLACKFOOT, IDA.**—The Utah Power & Light Company has connected its Grace plant with the substation of the Idaho Power Company in this city, giving double the source and an increase of current supply.

**SALT LAKE CITY, UTAH.**—Utah Power & Light Company has granted an increase in salaries affecting all employees receiving less than \$200 per month, which increases the total annual payroll by more than \$125,000.

**PUEBLO, COLO.**—The C. F. & I. Company's steel plant has been officially opened in practically all departments and will be in complete operation by January 1. The Arkansas Valley Railway, Light & Power Company has resumed street railway service to the steel district which had been discontinued on account of the strike.

**HELENA, MONT.**—A hydroelectric plant near Rimini to generate power for operating the street lighting system of Helena is being considered by the city council, it was revealed at a recent meeting. With wood pipes the project will cost \$125,000, according to figures submitted; concrete pipes, \$175,000, and steel pipes, \$225,000. This question also will be left to the voters, it is understood.

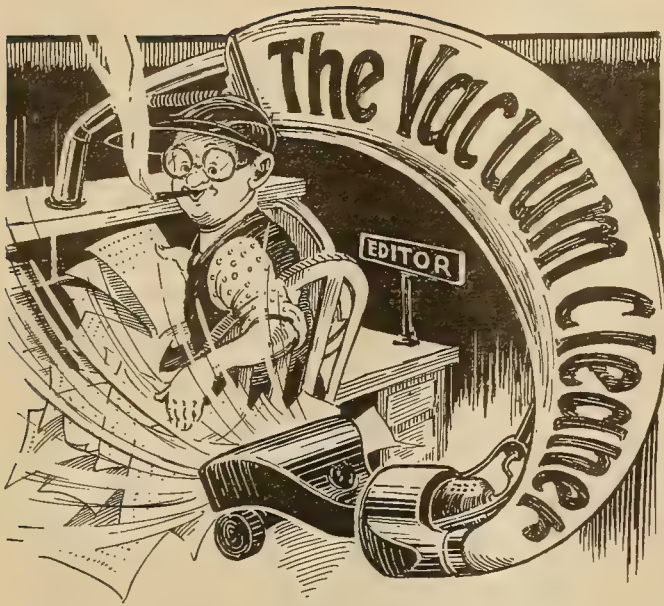
**PRICE, UTAH.**—The Eastern Utah Electric Company has been incorporated in this city to take over the present electric business of W. C. Broeker, which has grown to such proportions that it requires more capital and a larger concern to take care of the demand for supplies. The company will wholesale electric supplies and appliances in the eastern part of Utah, from Vernal to Monticello. They also expect to build up a considerable business in Emery county.

**POCATELLO, IDA.**—The Big Springs project for supplying water to towns along the Snake river was discouraged by Engineers E. S. Anderson and Virgil Samms, who told the recent convention of mayors that the cost would be excessive. The plan would have necessitated the construction of a 36-inch conduit 143 miles long, and the cost if built of wood was estimated at \$10,500,000; if of iron, \$15,000,000; or reinforced concrete, \$50,000,000. A further reason for discouragement is the fact that all of the fall is in the first 30 miles.

**LEWISTON, IDA.**—This place has been included in the plan of the Pacific Power & Light Company for extensive improvements and an engineer and draftsman were recently on the ground preparing the plans and specifications. Materials will begin arriving at an early date. The Pacific Power & Light Company operates the Lewiston gas plant and the appropriation for the Lewiston improvements was secured by Manager R. J. Jenks at a recent conference in Portland. The company will this year spend more than \$2,000,000 in improvements and betterments to its plants in the Northwest and several thousand dollars will be expended here.

**BISHOP, CAL.**—The Nevada California Power Company is planning to spend during 1920 around \$400,000 in development work on Lee Vining Creek in Mono county. This development will carry the work far enough along so that a power plant can be completed in 1921. The dam at Saddlebag Lake will be built to a height of 30 feet, which will mean an expenditure of over \$100,000, while 2,223 feet of flow line tunnel and the standpipe raise will add \$96,800. The balance of the work will consist of the foundation work on a diversion dam at Rhinedollar Lake, excavation for power house and foundations, installation of a tram, saw mill, camp buildings and equipment. The completion of this plant will add 15,000 horsepower to the system.





Speaking of truth, in accordance with the law which requires candidates for office to file a report of all expenditures, one of them turned in the following absolutely truthful report of what it cost him to get elected:

"Lost 1,349 hours' sleep thinking about the election.  
 "Lost two front teeth and a lot of hair in a personal encounter with an opponent.  
 "Donated one beef, four shoats and five sheep to country barbecues.  
 "Gave away two pairs of suspenders, four calico dresses, \$5 in cash and fifteen baby rattlers.  
 "Kissed 126 babies.  
 "Put up four stoves.  
 "Kindled fourteen fires.  
 "Walked 4,076 miles.  
 "Shook hands with 5,908 people.  
 "Told 10,101 lies and talked enough to make in print 1,000 volumes; attended sixteen revivals and was baptized four

different times by immersion and twice some other way.  
 "Contributed \$50 to foreign missions and made love to nine widows—five grass, four sod.  
 "Hugged forty-nine old maids.  
 "Got dog bit thirty-nine times and was elected by 353 majority."

\* \* \*

#### LITTLE LIMERICKS FOR THE FEEBLE MINDED

1. There once was a fellow named Botts  
 Who thought he could conjure with watts:  
 He mixed up the wire—  
 The house caught on fire  
 And burned up a couple of lots
2. A curious lady named Gamp  
 Who wanted to look at an amp,  
 Dissected her meter  
 Not dreaming 'twould treat her  
 The same as a wired-up lamp.
3. There once was a fellow named Bank,  
 Who went to his gasoline tank  
 And lighted a match —  
 He heard the first scratch  
 But thereafter his mind was a blank.
4. There once was a lady named Rich  
 Who looked at a high voltage switch;  
 She thought she'd find out  
 What it all was about  
 And found herself out in a ditch.

P. S.—In order that nobody may be blamed for these, we hasten to confess that they were composed by a member of our staff during a slight mental lapse. We found them in the waste basket, and anybody who wishes we had left them there can tear out the page and put them back again.

\* \* \*

Labor-saving devices are all very well, but when the millenium comes who is going to have the energy to work the devices?

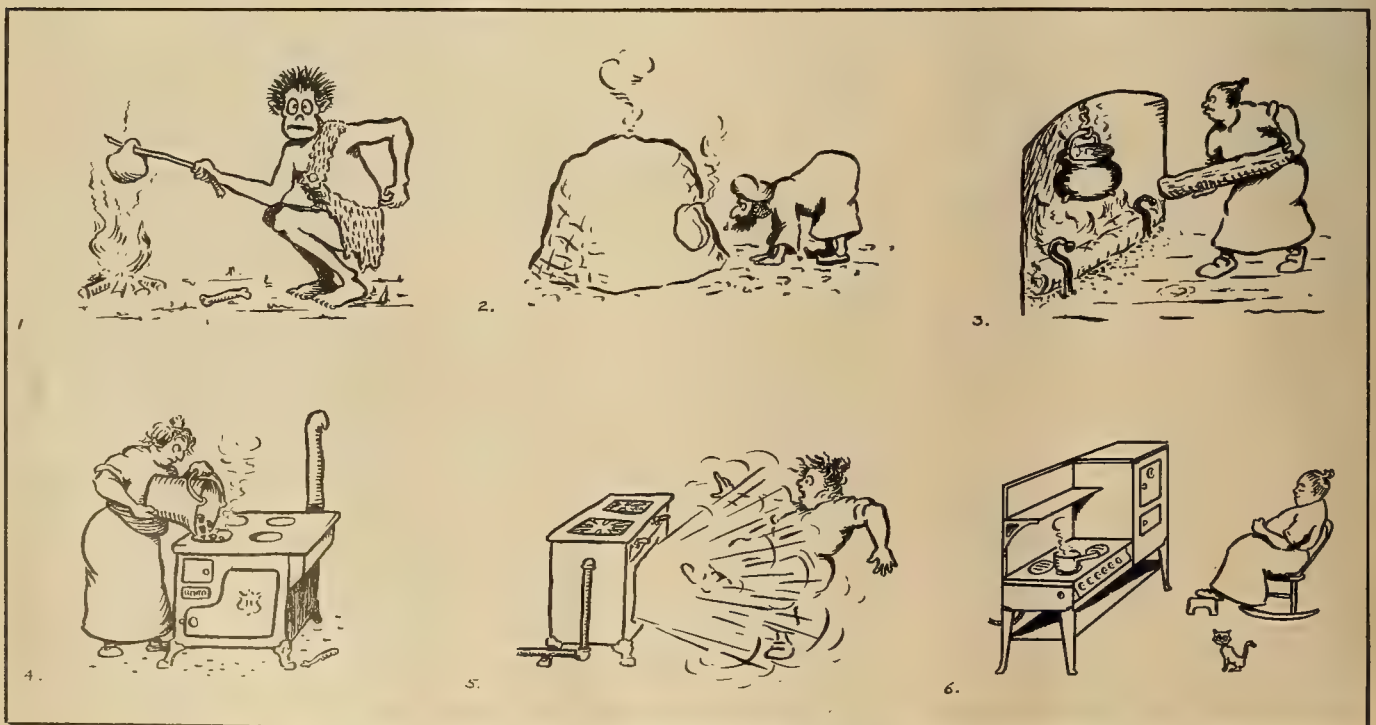
Lazy Lorenzo and Dog-Tired Dick were discussing something they knew little about—work.

"I think," said Lazy Lorenzo, "that if they did away with work altogether it'd put an end to these 'ere strikes."

"Yus," said Dog-Tired Dick. "That'll be the time when everything's done by electricity. Only got to press a button and the job's done."

A slow horror dawned in Lazy Lorenzo's eyes.

"That won't do!" he said emphatically. "Who's a-goin' to press the button?"



THE EVOLUTION OF ELECTRIC COOKERY

as displayed by H. C. Rice, of the Southern California Edison Company, in a recent address

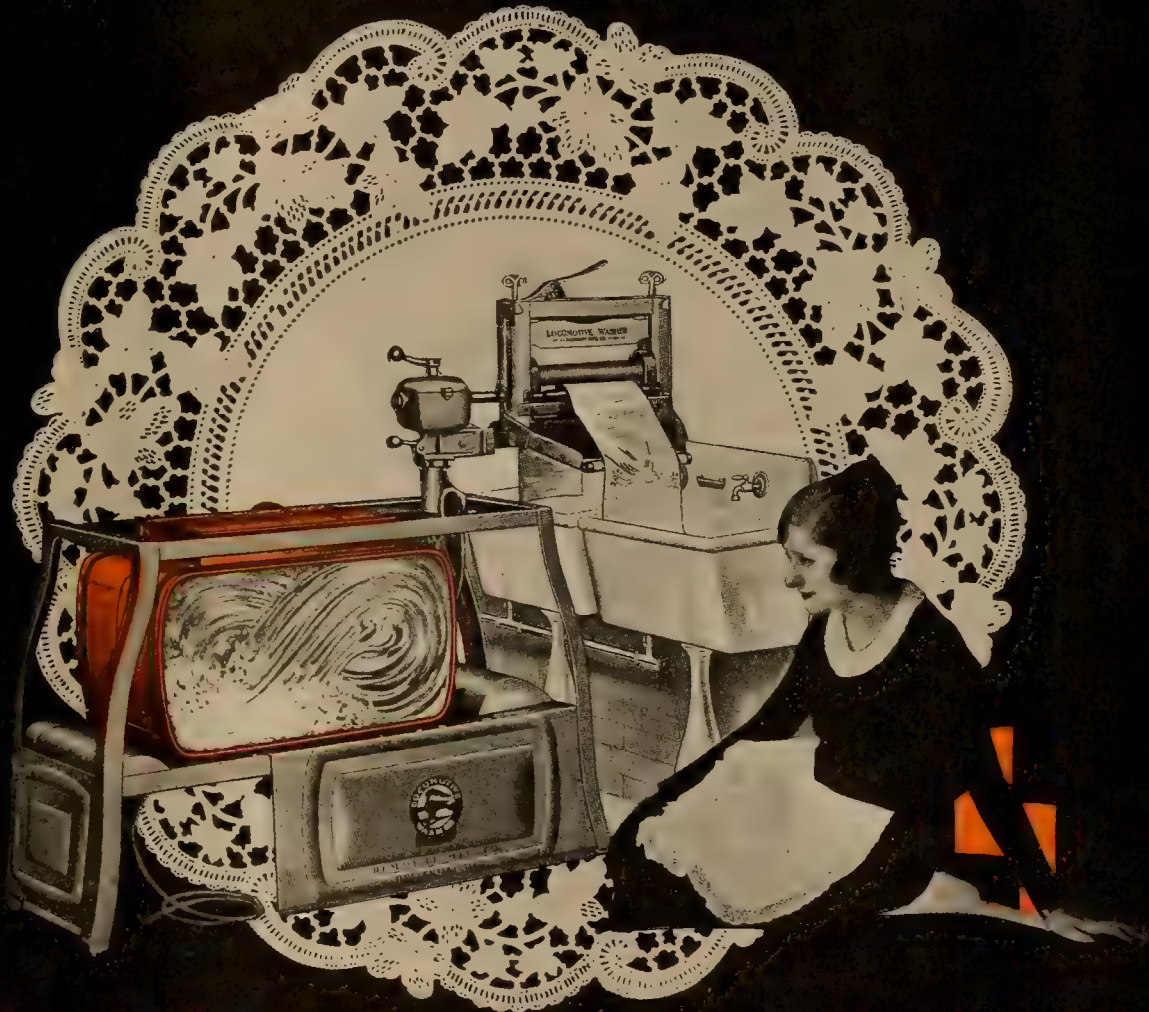


# JOURNAL OF ELECTRICITY

VOL. 44. NO. 4

SAN FRANCISCO, FEBRUARY 15, 1920

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# JOURNAL OF ELECTRICITY

FOUNDED 1887

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NUMBER 4

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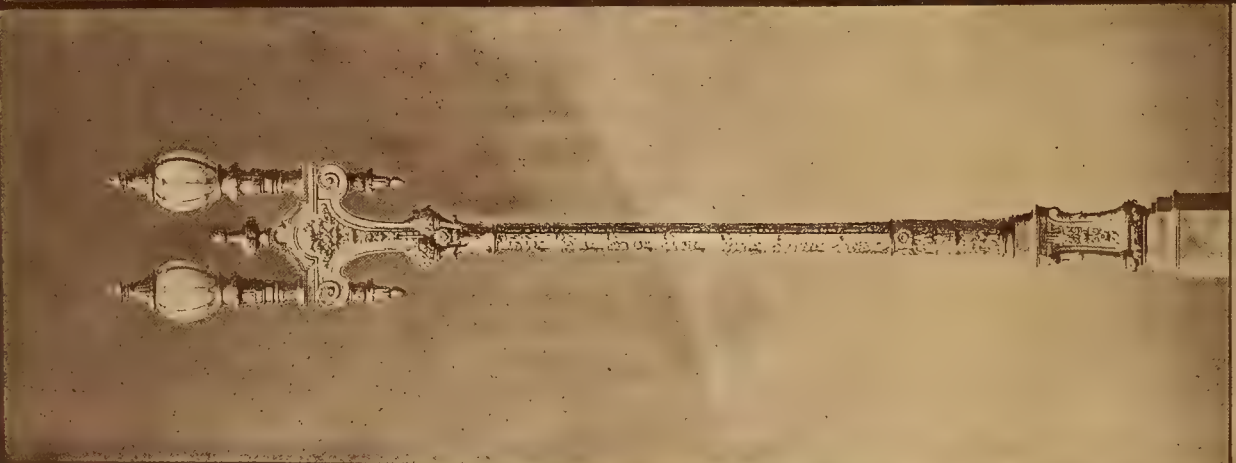


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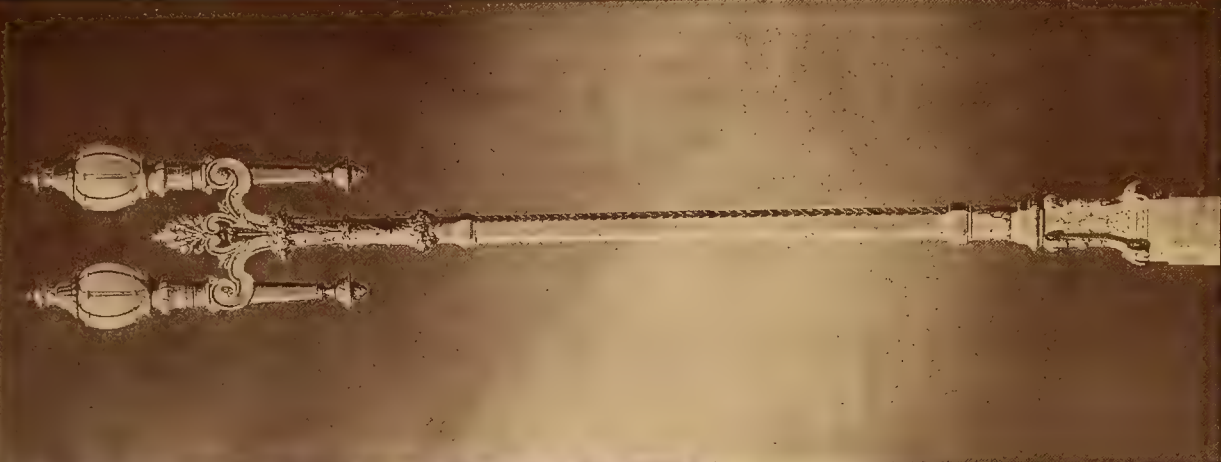


## "The Best and Most Artistically Illuminated Cities in the World"

is the latest record electrical to fail to the enterprising district west of the Rocky Mountains. The last month has witnessed the official completion in the Broadway business district of Los Angeles of an illumination system which marks for the great metropolis of the Southwest a civic achievement similar to the Path of Gold and the Triangle Lighting district in San Francisco and the beautiful downtown district in Salt Lake City. Three cities of the West thus stand in a class not even approached in quality of illumination or beauty of design anywhere else in the nation.



THE CALIFORNIA  
ILLUMINATION COMPANY'S PROPOSED ORNAMENTAL LUMINOUS ARC STANDARD  
FOR BROADWAY  
LOS ANGELES, CAL.



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ILLUMINATION COMPANY'S PROPOSED ORNAMENTAL LUMINOUS ARC STANDARD  
FOR BROADWAY  
LOS ANGELES, CAL.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, FEBRUARY 15, 1920

Number 4

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In these busy days befraught with sickness and stress of every nature, can we not indeed prove what the world so sorely needs to know at this time: that there is strength to be acquired from the giving of our strength, that energy or action directed along right lines does not impoverish nor enfeeble, nor does the hoarding of vitality enrich. As engineers and as men of

## STRENGTH

a great industry that means so much for the easing of human burdens, let us cheerfully give of our best in effort and thereby reap for ourselves a harvest of good activities that give to future action the only drive there is—the full stroke of a sincerity of action that is all-powerful. Such dynamic action is indeed the strength of which we are all in search.

The news that Franklin K. Lane has resigned as Secretary of the Interior, and that his resignation will be accepted by President Wilson, brings to the fore the importance of this governmental post, in which the West is more interested than perhaps in any other. The head of the Interior Department has an important influence over hydroelectric and other power development; in fact, this may be considered the greatest among all his great prerogatives. So vital did Mr. Lane consider this branch of his activities, that in submitting his recent annual report he prefaced it with the remark that it would “primarily deal with coal, electricity and petroleum as the three sources of light, heat and power, and the need for adoption of certain constructive policies affecting their production and distribution.” Following this, he enters into a comprehensive survey of the power resources of the nation, making far-reaching recommendations as to their future use.

Among the many administrative fields which come under the Department of the Interior are the Reclamation Service, the Geological Survey, Bureau of Mines, National Park Service, General Land Office and the Indian Office, besides supervision over the territories of Alaska and Hawaii. It needs no argument to show how much more directly the West is concerned with all of these than is the East.

Mr. Lane, who has filled this high office so long with distinction, is a Western man. His successor likewise should be a Westerner—a young man, with the energy and vision to promote most powerfully the immediate progress of the territory beyond the Rockies. For his decision and determination especially will be the problems of hydroelectric development, essential to the further expansion of industry.

The West wants the right man in this place—one with true understanding of the existent conditions, one who knows well how to meet them.

The United States Bureau of Housing has estimated that the next three years must see the building of at least five million homes in the United States in order to take care of the present congested situation in the home building operations of America.

Due to the domestic help problem, it is inconceivable to forecast any other statement but that the home of the future must be electrically equipped and wired in a manner surpassing present-day standards in every particular. Even a casual survey of the better residence districts of our modern cities emphatically shows that the installation of the baseboard receptacle, or what is otherwise known as the convenience outlet, is woefully lacking, and in the West, where the uses of electricity now prevail to a per capita extent of three times that elsewhere prevailing in the nation, such a situation is unforgivable. As a consequence, the paper on this timely subject which appears elsewhere in this issue, by Garnett Young of the Commercial Section of the Pacific Coast Section, N. E. L. A., comes with unusual emphasis. It behooves electrical men everywhere to do what they can to prevail upon home-



OUT OF REACH, out of use —  
AN OUTLET FOR EVERY  
APPLIANCE



builders and upon architects that the utmost consideration be given to this important problem.

See what this program means to the electrical industry. The question of the outlet alone in possible revenue mounts up into fabulous sums. At an average cost of two dollars, with ten outlets to the home, it would amount to \$100,000,000 in investment. To the power company the increased uses of electricity mount up into untold sums of money. It is estimated that such a program means at least 15,000,000 devices for home use. These bring in on the average an income of twenty-five cents per month, or three dollars per year; hence an annual net income of \$45,000,000 is possible for central stations throughout the United States from this crying need of the hour. The problem is a big one and deserves the earnest consideration of all.

The critical situation in which the West finds itself this year in regard to shortage of power, leads

#### Let It Not Be

#### Done by Halves

thoughtful men to view with considerable concern the danger of short cuts and half-measures in handling questions of power

development that may in future hinder or limit the ultimate harmonious and economic development of the water power resources of the West. In this connection it is to be hoped that such great developments as the Pit River project of the Pacific Gas & Electric Company will not be stunted in possibilities of complete development, but whatever is done in this wonderful power development program should be accomplished with the view of an extended plan that will ultimately use every available horsepower to its highest economic value.

Other instances of the West are also to be noted, and since the future destiny of this section of the country, both agriculturally and industrially, depend largely upon the economic development of water power, it is to be hoped that the broadest vision will prevail in these particular instances.

The question of licensing engineers will again come up for consideration this year. Several West-

#### Barring Foreign Engineers From Practice

ern states have already adopted such laws and the matter will be taken up before the legislatures of the others at their

next session, either this year or next.

Engineers generally would perhaps be just as satisfied if there were no such laws in existence, but there seems to be general feeling on the part of the public that licenses should be demanded for engineering work as much as for doctors or public accountants, and if such laws are to be passed, they should certainly be such as are framed by the engineering profession itself. The suggested law providing for uniform regulations in all states which has been prepared by the Engineering Council is therefore a step of very general interest. A lack of uniformity between states would be extremely unfortunate, and this action is one which should be welcomed by local committees handling this subject.

On the whole the suggested law is admirable and may well serve as a basis for local ordinances. In the zeal of protecting Americanism, however, one very surprising omission has crept in. No provision is made for the foreign engineer who may be called in on special work. The law calls for a state license for any engineer carrying on more than fifteen days of work in one state during the year—and specifically states that no license may be issued except to one who has at least taken out first citizenship papers. The absurdity of the regulation is at once apparent when we reverse the situation and suppose, for instance, that an American engineer be barred from practice in Australia or India unless he become a British subject.

With the extremely loose thinking going on at the present time in this country, it is possible, of course, that this provision is not an oversight, but we prefer to give the compilers of the proposed law credit for broader patriotism. In any case, it is a matter which should be remedied and an amendment which should be called to the attention of any local committee framing an ordinance for actual adoption.

Street-illumination at once effective and artistic is the aim of every modern municipality of advanced

#### Street Illumination in the West

ideals. Several cities of the West have taken the lead in the movement for better lighting, and the achievements of San

Francisco, Los Angeles and Salt Lake City in this direction are particularly notable. "The Path of Gold" illumination of San Francisco's Market Street deserves to take place with the very best street-lighting systems of the world, and it is satisfying to know that through the activity of the Down Town Association its continuance in full brilliancy is assured for three years more. Los Angeles now has a "Radiant Way" in its Broadway, as described in the leading article of this issue of the Journal of Electricity, and the "White Way" lighting system of Salt Lake City is already famous.

The general consensus of opinion is that the modern illumination arrangements on the main thoroughfares of these cities combine utility and beauty in a truly admirable manner. Some criticism there has been indeed, but not of a persistent nor widespread currency. The objection has been ventured in Los Angeles, for instance, that the clusters of lights are too high above the street, but on the whole the public appears well satisfied with the effect.

Merchants of the main retail districts find their places of business much improved by the installation of these new lighting developments, and those that have contributed to the upkeep of the systems feel that the outlay has been wisely expended. Other municipalities in the United States which aspire toward the "city beautiful" ideal are pointing to the illumination features of San Francisco, Los Angeles and Salt Lake City as models to be followed in future city-planning.



One Western power company had some trouble about a year ago with a number of small heaters which were sold through department stores and other non-electrical sources, due to the fact that the owners of these heaters had been given a false idea of their cost of operation at the time they purchased them. They started out with the understanding that the heaters would cost but 1c per hour to operate and blamed the power company for the size of the bill which was furnished them at the end of the month. Through the educational process of having to pay their bills, this difficulty has now been done away with, but it suggests a simple remedy which might have forestalled the trouble in the first place.

Electric appliances are now plainly marked in volts and amperes, which information is undoubtedly useful in selecting fuses for the circuit on which the heater is to operate, but is unintelligible to the householder in predicting the amount his bill is to be. He pays for service in watts and kilowatts, and only in exceptional cases is he able to translate the one set of figures into the other. It would be a simple matter for the manufacturer to add the necessary wattage to the information on the nameplate and thus avoid confusion in the mind of the purchaser and even in that of the non-electrical dealer, through which channel so many of these simpler types of appliances are at present sold.

It is quite gratifying for men of the electrical industry in the West to know that the California Electrical Co-operative Campaign has gone, with its ideals, to the East. A recent gathering of men of national standing in the electrical industry, met at the Engineer's Club in New York City, in order to hear first hand reports of the accomplishments of the California Electrical Co-operative Campaign, and so impressed were they that they have immediately set about to see how this good work may be started in other communities of the Nation. The final outcome of this meeting will be, that at the great convention of the National Electric Light Association next May in Pasadena, a full report will be presented to the Society in the minutes of the Association, setting forth the accomplishments of the California Electrical Co-operative Campaign and also recommendations as to how its good advantages may be taken to other communities of the Nation and put into practical operation.

Broad-minded men realize that the best way to secure fruitful results from a campaign of this nature is to establish it in districts, not too large, but that personal contact may be maintained constantly between all parties to the issue and between the public which it desires to serve. At the same time there must be spread broadcast the idea that such a campaign is not to put the central station out of the merchandising field, but rather to co-ordinate the work of the central station and contractor-dealer in the merchandising of electrical ware in such a manner that all may secure a reasonable return for

the service rendered. This was the one big bugaboo that had to be overcome in the California plan in its early days, and today the results speak for themselves on all sides.

For many months speakers have covered the country broadcast and have heard how such a work can be done, but here is an instance where the actual results have been accomplished, and as a consequence an instance where the results speak for themselves. In all of this work, however, it is to be remembered that the California Electrical Co-operative Campaign is but in itself a mere symbol of working relationship in industry. Other organizations have contributed powerfully to its success, for instance, the California Association of Electrical Contractors and Dealers, the Pacific Coast Section, N. E. L. A., the various leagues, such as the San Francisco Electrical Development League and other institutions of similar nature, have backed the campaign from its very inception, so that its success is due, not alone to the method of organization, but fundamentally to the spirit or vision back of it all which has been of such a highly co-operative nature, and so helpful in its very make-up that success from the start was assured.

All of these facts should be well borne in mind by those in other communities considering the establishing of a similar plan of operation, and if noted with care and if the seed is properly sown, in such new communities the success of the undertaking cannot but prove assured from the start.

The record of work accomplished by Western engineers in the great engineering developments going on the world over is an inspiring tribute to the quality of enterprise and skill developed in the solution of the tremendous problems of the West along engineering lines. Among the engineers recently so honored are F. G. Baum, who has handled extensive electrical work in South America; H. T. Cory of Berkeley, California, who goes to Egypt on the international engineering commission; O. W. Peterson, who has been installing big undertakings in Chosen; J. H. Anderton of Stone and Webster Engineering Corporation, who goes to Japan to install a 30,000-kw. hydroelectric plant there; A. S. Kalenborn, recently returned from important engineering work in Peru; A. C. Jewett of the General Electric Company, who has been prominent in the development of the hydroelectric resources of Afghanistan—as well, of course, as such well known examples as Herbert Hoover, whose work has taken him to every corner of the globe.



AN OUTLET in need is a convenience indeed —

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The West has long appreciated the quality of engineering talent which has developed in the ranks of its public utilities and independent engineers—and it is a source of satisfaction to find that this is being elsewhere recognized. Unfortunately in the past, the connection with large financial interests possible to Eastern men has in large measure militated against the employment of Western engineers in a consulting capacity east of the Rocky Mountains; has indeed, often led to the importation of engineers from elsewhere into Western territory, where the local engineer may have represented the highest type of talent to be obtained along these lines. As a matter of fact, there should be no distinction of engineers along geographical lines, rather upon the fields in which their experience and ability have given them special advantages. Upon all lines of hydroelectric achievement, as well as in the problems of irrigation enterprise, the West offers peculiar opportunities for daring construction and original enterprise and it will be found that in consequence, many of the engineering advances of recent years have come from this region. It is gratifying to find that this is being recognized in foreign countries as well as in other sections of our own.

In May of this year the West is to be visited by literally thousands interested in the various phases of the electrical industry. Many of these men are vitally concerned with electrical merchandising, and they are coming with the definite idea of finding business features worked out on the Pacific Coast which will assist them in solving their own merchandising problems. Particularly are they desirous to learn how the teachings of the California Electrical Co-operative Campaign have been applied in practice by the contractor-dealers of that State.

The electrical stores of California are to come under the critical gaze of many visitors. And these appraising thousands are the ones who will bear to the East the news of what the West is accomplishing in the institution of modern retail methods. They, above all, are the ones to transmit "the message of the West." Surely, to meet this visitation of electrical merchants from the East, and to make the most of their splendid opportunity, the contractor-dealers of California must be on the alert for even greater improvement. Now that the healthy holiday hustle is at an end, the obvious time has come to

make amendments in the store-policy. Window-trims have improved immensely within the past year, yet there may be room for improvement behind the imposing store front. Let each dealer examine critically the interior arrangement of his place of business. Let him question himself as to whether it is all it should be—ready for inspection by the grand reviewing party that travels hitherward in May.

There is a strong movement on foot to improve the lighting of factories and other industrial concerns, principally for the purpose of decreasing the number and seriousness of industrial accidents. As a by-product of better lighting is obtained an increase in production, amounting on the average to some twelve to fifteen per cent, and this at an average increase in cost of only about one per cent of the usual payroll expense.

One of the objectives of better illumination is to decrease the eye-strain of the workers. This objective is only attained when improved lighting is carried to its ultimate; when every place visited by the worker is well and plentifully illuminated. Of equal importance is the home. Usually the home is lighted by either "decorative" lights or by lights which are so low with reference to the eye that glare results. And in either case the quantity is insufficient. The abandonment of the policy, by power companies, of giving free lamps of the old carbon type is a step in the right direction; the carbon lamp could not give enough light, and its intensity was so low that it was necessary to use it unshielded in order to have much benefit from it. The introduction of gas-filled lamps of higher intensity forced the use of fixtures of the indirect or semi-indirect type, when new installations were made. Old fixtures are receiving new type lamps, much to the damage of the users.

Here is, therefore, a fertile field for power companies in extending to the homes the illuminating engineering service given larger consumers. This is not such a formidable proposition as it seems at first glance: the work could quickly be standardized so that the engineer would be able to advise the householder in a few minutes time of the proper lamps to install. This is a progressive step that should greatly ingratiate the utility companies in the hearts of the consumers they serve.

## *Watch for the March 1st Journal*

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Effective Methods of Selling Electrical Goods.

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Day and night views of Broadway, Los Angeles, showing the new lighting system. The greatly increased effectiveness of the new installations is well illustrated by the corner shown in the foreground of the night view: the wall of the building on the side street is in almost total darkness, in spite of the proximity of a street lamp, while the wall of the main street is well lighted by the newly designed lamp. Photos by G. H. Bishop.

## New Intensive Street Lighting

BY W. D'A. RYAN

(The value of a well-lighted street, both to business interests and to the community as a whole, can hardly be overestimated. In view of the current interest in outside illumination, the following account by the director of the illuminating engineering laboratory of the General Electric Company of the "White Way" improvements in Los Angeles, is especially timely.—The Editor.)



Adequate outside illumination in a populous city is an important safety factor as well as an asset to the community

HE popularly styled "White Way" or ornamental street lighting of Broadway, Los Angeles, had its inception through the initiative of the Broadway Improvement Association. This system consisted of 7-globe standards, 13½ ft. in height, and was first lighted in 1906, with carbon filament lamps. The advertising value to the city through this lighting has been enormous. Many hundreds of other cities have since installed the cluster system of lighting standards. It is, there-

were completed and subscriptions started. The proposition was carried through in accordance with the Street Lighting Improvement Act; the property owners being assessed for both the installation cost and maintenance. The contract for the installation of standards and wiring was given to the Keystone Iron Works of Los Angeles early in 1918, but, due to the delays incident with the war, the system has just been completed. The contract for the lamps, their installation and maintenance, was let to the City of Los Angeles.

The initial installation extends from the Tunnel to Tenth Street on Broadway, a distance of approximately 7,200 feet. There are 134 standards each carrying two 6.6-ampere General Electric luminous arc lamps, equipped with the eight-panel globe with yellow Carrara glassware. Sixty-seven of these lamps burn all night; the remaining two hundred and one are extinguished at midnight. The total cost of this installation is approximately \$100,000, of which \$85,000 has been borne by the property owners and the other \$15,000, for station equipment, has been expended by the City of Los Angeles, which will supply current and maintain the lamps. The annual cost of maintenance will be approximately \$14,000, of which the city will pay less than \$1,000. The first annual assessment to the property owners

fore, befitting that Los Angeles should again be among the leaders in the present epoch of "Intensive White Way" lighting of commercial streets and again the Broadway Improvement Association is responsible for this progressive step.

In 1916 a committee of this association, headed by F. W. Blanchard and E. Avery McCarthy, requested W. D'A. Ryan, Director of the Illuminating Engineering Laboratory of the General Electric Company, to design a modern system of street lighting for Broadway. In the early part of 1917 complete plans and estimates were submitted and approved. Several months later final specifications



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was approximately \$7.50 per front foot. This included the installation and the first year's maintenance. For each succeeding year the assessment will only be about \$1.00 per front foot.

The lighting standards are of two designs: the Spanish Renaissance, which are used at street intersections, and the Rose design, located amid blocks. The use of two designs on the same street is a new note in street lighting and is successful in breaking up the monotony of repetition. The general silhouette of both standards is the same; the arcs being approximately 25 feet above the sidewalk. Both standards were designed by J. W. Gosling of the

Illuminating Engineering Laboratory, under Mr. Ryan's direction.

The luminous arc used is generally recognized as the most economical street illuminant for "White Way" lighting. The pure white light of the arc is an essential contrast to the warmer tones of signs and show windows. At present indications point toward further advances in efficiencies for the luminous arc electrodes. It is safe to say that Broadway has a system of lighting which will remain in first place for many years to come. As new and more efficient electrodes are developed they can be used in the present lamps without any change in mechanism.

## The Value of Proper Illumination

BY F. D. FAGAN, R. E. FISHER AND HUGH W. KIMBALL

(Good lighting increases production, safeguards life, beautifies the home and serves the community in a thousand other ways. A full discussion of this important subject is presented in the following paper by the district salesmanager of the Edison Lamp Works, San Francisco, one of the advance papers from the Pacific Coast Section, N. E. L. A. 1920 convention.—The Editor.)

The great war, however expensive in human lives, production and arrested development, has had its compensations. It is hardly unreasonable to believe that medical science by its war experience has not accumulated knowledge which shall enable it to save in future as many lives as were lost, due to direct and indirect war causes. The practical lessons in industrial co-operation and co-ordination, taught by the necessities of a long struggle have had their compensations to offset the loss of production during hostilities. On every hand inventions and developments, arrested by war, are evidencing a new vitality that is inspiring to optimism. For proof of this we need go no further than a peek into the one hundred million dollar hydro-electric development project started in California.

In the lighting field the war has confirmed many of our surmises and proven many unsupported contentions with reference to the value of proper illumination. For many years we have known that either natural or artificial light properly applied has benefited mankind somewhat, and when improperly applied has been a detriment and in many cases a menace.

By comparing accident and crime statistics and merchandising prosperity in towns with well lighted streets with towns in which the streets are indifferently illuminated, we have suspected that such comparisons were in favor of the well lighted towns. But the war, with its enforced fuel economies and dangers from night air raids by forcing us to curtail lighting, has shown us the value of proper illumination. City crime and street accident statistics have shown an increase where the lighting has been reduced.

We have known in a general way that insufficient and incorrect lighting in industrials was a brake on production and a menace to the safety of the workers. But the war with its vital need for maximum output with diminished forces was the direct cause of careful and extensive surveys being

made to determine what possible helps were available for increasing output. These surveys resulted in definite surprising records of proper illumination increasing production.

Less obvious perhaps, but nevertheless important lessons have been learned with respect to proper lighting in the home. Insufficient and glaring light in the home, besides being a cause of accidents, results in eye strain and very often the permanent impairment of vision. The home influence is perhaps the most potent for good and industrial effectiveness. Proper lighting is necessary for a complete home.

So in this paper, an attempt will be made to show the value of proper illumination. It will be left to others to determine what is proper illumination and how it may be obtained. These authors will have accomplished their purpose, if what is written here may create renewed interest in correctly applied illumination, and an even greater aversion to improper lighting than now exists. For the purposes of this paper the terms, "Proper Illumination," "Correct Lighting" and "Good Illumination" may be considered synonymous. They mean, that quantity, quality and distribution of light are required to substantially accomplish the purpose for which it is intended.

### Home Lighting

The value of proper illumination in city streets, stores, factories, etc., can be established more or less definitely by experiment. Unfortunately, it is not so easy to determine the value of proper lighting in the home. We know that sufficient and correct light in the kitchen tends to promote cleanliness and proper preparation of food, which affects health. We know that light incorrectly used in the sewing room, library and living room impairs vision, and if the conditions are aggravated, permanently injures eyesight. We know that serious injuries have been caused by falls due to glaring and insufficient light in stairways, halls and basements. But there are



effects due to improper lighting which are even more insidious, because they are less evident. Improper lighting affects the disposition, good temper, cheerfulness of the inmates of the home. Because these effects are psychological in nature, they are more difficult to determine and describe. The initiated know, but the average person may live with terrible lighting-conditions and be conscious of something being wrong without knowing what it is. Many of us have had a social evening at a friend's house spoiled by glaring light sources. To sit for hours before a hideous glaring living room ceiling fixture is enough to try the good temper of a saint, let alone an ordinary human being. It is this aspect of the value of proper illumination that is perhaps the least considered, if not the most important. It is second only to that of the conservation of vision. Proper illumination is necessary to a happy home, and fortunately it is a procurable commodity.

Good illumination properly applied is no more costly than poor lighting. It is within the reach of the vast majority, but like all good things, money alone will not suffice. Care and study are necessary. Co-operation between architects, decorators and lighting specialists is imperative to insure that proper lighting furnishings shall be available and properly applied.

Not all of the responsibility rests on their shoulders. In the past, apparently there has been an all too evident disposition on the part of the user to neglect the lighting of his home. It has been one of the last things considered and, seemingly, the least important, yet it affects directly health, cheerfulness and good temper. Irritability, excited by improper lighting has no doubt been in many cases the indirect cause of family differences. If the user is to enjoy the fruits of a happy home, he must give to the lighting problem the same careful consideration as he does to its other important details. Glaring light sources, whether in the ceiling fixtures, side brackets, floor or table lamps, should be avoided.

Proper lighting has the same value in the school, as it has in the home. Obviously, further comment is unnecessary.

### Show Window Lighting

No one questions today the selling power of the display window. The relative rental cost of show window frontage to store floor space is ample proof that the show window is by far the most valuable part of the store. While merchants have realized this for some time, it has only been in recent years that they have recognized the full value of their windows as a sales asset.

Show windows, however attractively dressed and arranged, sell merchandise only when the merchandise can be seen. Artificial light is needed during the dark hours to complete a window and that artificial light must be properly applied if it is to be effective. Illuminants incorrectly placed and arranged may be almost as ineffective as no lights at all.

A display window is much the same as a stage

in a theatre. The goods on display may be likened to the actors and the window shoppers to the audience. The good stage manager contrives to keep all glaring light sources out of the eyes of the audience and at the same time light the actors in such a way that their every move and expression may be clearly seen by the audience. He contrives to arrange his stage lights so as to have the shadows in the proper direction and to have the proper amount and quantity of light to produce exactly the effect he desires on the audience.

And so it is with the window dresser. His object is to sell goods and not to display lighting fixtures or glaring light sources. He desires to arrange his window so as to set his merchandise off to good advantage and in their true light as to quality and design.

The proper lighting of the show window takes into account the location of that window, whether it is in a small town, in the outlying section of a large city, or in the downtown business section of the large city. Clearly, a large volume of light is required in the downtown business section of the city, for the reason that a window so located is in competition with those of other merchants, and chiefly, because the streets are illuminated to a higher intensity. Consequently more light is required in the window to attract the attention of the pedestrian. A well lighted window attracts the passerby, much the same as a bright light attracts the moth. Window shopping is most effective when the busy business man is relieved of his day's cares and his mind is most receptive to his personal needs.

More and more artificial light is used for display lighting in the day time, as it has been found that proper light from within the window during the day nullifies somewhat the bad effect of reflections from the plate glass. Very often these daytime reflections are so prominent as to reduce the effectiveness of the window.

### Store Lighting

The fact that nearly all stores, especially those handling dress goods, suits or clothing, use artificial light throughout a great part of the day, makes it extremely important that such stores have efficient lighting arranged so as to give the correct distribution and right quality and quantity of light.

It is impossible to estimate the value of a well lighted store, from the standpoint of the effect it has upon the consumer, because it has a psychological effect which influences one person differently than it does another. The impression received by a customer of a well lighted store is cheerfulness and ease in which to see the goods, thus giving the merchant the benefit of his well arranged counters,



A BASEBOARD RECEPTACLE by any other name would be as convenient —

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shelves, show goods, etc. No matter how well the goods may be arranged, unless there is illumination without glare, the storekeeper will lose a great part of the good effect of his displays.

Frederick J. Pearson, electrical and mechanical engineer of Marshall-Field Company, of Chicago, in a paper before the Illuminating-Engineering Society, said: "Good lighting increases production just as it increases sales in a store. Increases of illumination intensity from 6 to 10 foot-candles have increased the cost of lighting by only 1 per cent and have been found to promote sales by 6 or 7 per cent."

The value of proper illumination to the merchant in his cloak and suit department, and particularly in the fitting rooms, where suits, evening gowns and other garments are displayed, is underestimated many times by the merchant, little care being given to the method of lighting. This should be considered carefully and illumination so arranged that it lights the entire garment rather than making it necessary for the customer to turn around toward the light in order to see the effect upon either side of the garment.

While it is true that the furnishings and fixtures of many large stores carry the design of some particular period and the electric fixtures are designed to fit this period, the particular question considered by the merchant is the design of the fixtures rather than the lighting effect upon his customer.

In these days of high wages, time is of great importance to the merchant, and yet many merchants will fail to give any consideration to the illumination of their stock rooms, thereby wasting a great deal of the time of the clerks endeavoring to locate surplus stock. This should be given more consideration as a loss of a few minutes by each clerk amounts to considerable at the end of the year.

Errors in marking and checking of goods in shipping departments are frequent. While all errors cannot be prevented, the readiness to see and read sales tickets and packing case labels is extremely important. A fairly high intensity of illumination in these departments is important, as it contributes to the elimination of costly errors.

To summarize, the importance to the merchant of proper illumination brings out two important requirements—the ability of the customer to see clearly the goods on display thereby creating the desire to buy under these conditions, and the ability to locate articles and goods on shelves quickly, thereby increasing the efficiency of the salesmen as well as creating a record for good service.

### Street Lighting

It is hard to estimate the value of properly lighted streets to a city and its merchants. From an advertising point of view, there is no greater asset to a city than to have it known as a well lighted city. The Path of Gold in San Francisco has advertised that city throughout the United States, not from its name but from the fact that it was one of the greatest steps in illumination ever taken by any city; the same applies to the street lighting of any city.

The merchant does not appreciate the value of

this lighting to him from an advertising standpoint as much as he should, for without good street lighting, people will not visit the downtown districts, with a view of doing what is called "Window Shopping." If the streets are well illuminated, people will take their evening strolls in the business sections and are likely to be attracted by some article on display which they may purchase the next day.

The reduction in crime from street lighting has been a well known fact for some time, but not until recently has it been forcibly brought to the attention of the country. A recent proof of the value of street lighting is that of the city of Chicago where criminal complaints increased with the shutting off of the street and other lighting as a coal conserving measure. A two days' record made public on December 6, 1919, by John J. Garrity, chief of police, reads as follows: "Yesterday, the first of semi-darkness, the report showed 56 criminal complaints, 16 burglaries, 10 robberies, 20 larcenies, 1 safe blowing, 2 murders and 7 miscellaneous, as against 34 criminal complaints the preceding 24 hours when approximately normal conditions prevailed."

Just as a city increases its illumination, it may decrease its police force. While it is appreciated that no city could increase its lighting to such an extent as to have no use for a police force, a great saving is accomplished through the city street lighting. Unfortunately, there are very few cities today that have given very serious consideration to the lighting of the residential districts and many of them are far under what would be considered a good standard of illumination, thus making it difficult for the pedestrians to go about at night without the possibility of some criminal taking advantage of the semi-darkness, either robbing, or perhaps murdering as the case may be.

### Industrial Lighting

However valuable proper lighting is in the home, store and city streets, our immediate need for more and better light is in the industrial field. Extensive investigations of industries in Chicago, conducted by competent lighting experts of the Commonwealth Edison Company, in conjunction with plant managers, has awakened the lighting industry. These results indicate that a 15 per cent average increase in production is possible at an added cost for lighting of but 1 to 6 per cent of merely the labor cost. Individual factory outputs were carefully recorded during a month's run under indifferent lighting and compared to the production during a corresponding period under practically identical conditions, except for a change from indifferent to proper illumination. The results of some of these tests are briefly summarized in table I.

Class of Business	—Old Lighting—		—New Lighting—		Average Increase	Increase Cost
	Watts Sq. Ft.	Foot Cds. Intensity	Watts Sq. Ft.	Foot Cds. Intensity	Produc.	Add. Ltg.
Iron Pulley Finishing Shop	.27	.2	1.90	4.8	20	5.5
Heavy Steel Machine Shop	.60	3.0	1.70	11.7	10	1.2
Carburetor Assembly Shop	1.00	2.1	1.90	12.5	12	.9



It will be seen that better lighting increases production and that at a comparatively insignificant cost. In the words of Mr. Floyd W. Parsons in the Saturday Evening Post, November 15 issue, this 15 per cent increase "is equivalent to the production of an army of approximately 1,500,000 workers, who consume neither food, clothing nor materials in any form; an army that produces without additional factories or machinery; an army that gives at least two-thirds of its wages to be divided between capital and labor."

We are short of the necessities of life and consequently, prices are high. During the war, approximately 27,000,000 men were taken from the ordinary pursuits of productive labor and set to destroying each other and useful material. Furthermore, these same men, owing to the stress of war, consumed more food and more clothes than they did in peace time. The result is that we have used up our ordinary reserve supply and now face a shortage of the necessities of life. Short supply and a long demand elevates prices. President Wilson's "consume less and produce more" solution of the present high cost of living seems to be a practical one.

To consume less is comparatively easy, if not pleasant. To produce more is the real difficulty. Our need for the actual necessities is so great that little effort at present can be devoted to increasing our machinery of production. Our labor supply has been reduced by the killing and permanently maiming of approximately seven million men in the war, and by the reduction in working hours obtained by many of our most productive laborers during the last few years. In this connection, the fact that Germany's new constitution has established nationally the eight hour day is significant. So the problem we face is to increase output with the same machinery of production and a greatly diminished working force. W. S. Palmer, U. S. Attorney General, says "The country needs to quit fighting and go to work on maximum production, that 10 per cent more production would cut 20 per cent from present living costs." Proper lighting offers at least a partial solution of this problem, because it has proven itself a means of increasing production.

Mr. Frederick Pearson, electrical and mechanical engineer of Marshall-Field Company, a company having extensive manufacturing enterprises in conjunction with their large department store, has made an extended study of lighting as applied to Marshall-Field Company's factories and makes the statement in a paper before the Illuminating Engineering Society, "An increase of lighting cost of 2 per cent in one installation was reflected in an increased factory production of 10 per cent. In fact, improved lighting is one of the greatest dividend producers whether in the factory, store or the office."

Proper factory lighting, in addition to increasing production, has the further advantage of reducing spoilage and factory seconds. Spoilage is a direct loss in material and labor, and factory seconds are a partial loss, since they are usually sold at a reduced price. Proper illumination reduces spoilage and factory seconds, because it enables the workmen

to measure accurately and perform their functions without guessing.

A well lighted factory or office is a pleasant place to work in. The employees like it because it enables them to do their work with comfort and without eye strain, and because it shows a disposition on the part of the employer to provide them with proper working conditions. The majority of satisfied employees favorably disposed towards the management usually remain permanent employees. This results in a lower labor turn-over, and consequently saving in employment and training cost. One company estimates that the training cost of one new employe in spoilage, factory seconds and the loss of production on the machines and floor space occupied by the employe, varies between \$200 and \$1,000, depending upon the operator and the nature of the process. If the labor turn-over of a plant, employing 500 people, is 20 per cent, this results in a production burden of from \$20,000 to \$100,000 yearly.

One of the great mistakes made by large industries and department stores is their lack of consideration for their office force. This is not intentional, but little study has been made of the value to the employer of proper lighting in the office. The elimination of all glare from portable fixtures, etc., in a large office will materially affect the efficiency of the office force. Extreme care should be taken in arranging for proper illumination in the office, regardless of its size.

Proper lighting has a value in preventing accidents and in conserving vision impossible to estimate. For certain purposes, we place a value on human life, but no one can estimate the misery and sorrow occasioned by the loss of a loved one. Investigations by insurance companies, large corporations and government agencies, have found improper lighting is the cause of a surprisingly large percentage of industrial accidents. Authorities vary in their estimates between 18 and 25 per cent. From 18 to 25 per cent of our one and a half million yearly accidents is a tremendous loss to charge up to wrong lighting. It is appalling to think that each year our industries kill and maim a number of men equal to America's casualties during the great war.

Industrial accident commissions in several of our States recognize this and have issued lighting orders or codes, which require employers under their jurisdiction to install lighting of the proper quantity and quality to prevent avoidable accidents, due to lighting conditions. These codes or orders have proven their value in New York, New Jersey, Wisconsin and Pennsylvania, where they have been in effect for some time. John A. Hoeveler, electrical engineer of the Industrial Commission of Wisconsin, in a paper read before the 1919 convention of



AN OUTLET in time saves much expense later —

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the Illuminating Engineering Society on the "Application of Industrial Lighting Codes," makes the following significant statement:

"Since the adoption of the new code (July, 1918), we have been successful in getting the new installations up to a considerably higher standard than the code minimum.

"The years of educational work of the Society (I. E. S.) and the lighting industry is bearing fruit. Almost never do we encounter resistance, in fact, it is rare to find an employer who will not voluntarily install better lighting than the code requires of him. The RLM standard dome reflector has largely displaced the flat cone in the minds of shop superintendents as about the right thing for factory lighting. Obviously, this makes enforcement of the anti-glare rule easier, since this reflector gives a better degree of shading than the code specifies as a minimum."

Rowland Leveridge, Department of Labor, State of New Jersey, in a paper on the status of the Industrial Lighting Code in New Jersey, says before the Illuminating Engineering Society:

"Our experience with plant managers in furthering the better lighting movement indicates that they welcome the introduction of the code as they realize that it permits more efficient operations of the plant. We anticipate no trouble in securing the desired results in this class. There is, however, a more or less thoughtless element in all industries which would require in some cases a close application of the education program and in others, coercive measures to bring about the desired improvements."

Mr. John H. Vogt, of the New York State Industrial Commission, says:

"There still remains a great deal of work to be done to bring up factory lighting to the code rule standard. A good start has been made and the Industrial Commission will not rest until this important feature of factory inspection has been thoroughly accomplished."

Other states, among them California, Ohio, and Oregon have recently issued lighting safety orders and other states have them under consideration.

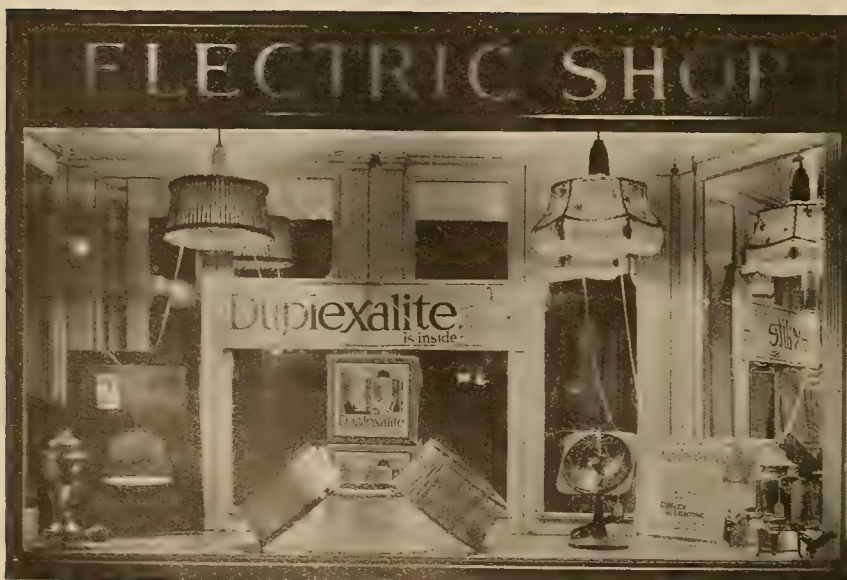
### Summary

We have tried to show that proper illumination has a value to the individual and the nation, because it prevents accidents, conserves eyesight and promotes healthful and happy conditions in the home and school. We have indicated that correct lighting

is a positive sales factor to the merchant; that it is necessary to promote sales in the store and show window. We have pointed out the value of good lighting in the prevention of crime and accident and the promotion of merchandising prosperity, when applied to our city streets. We have laid particular stress upon its value in the factory and shop, in preventing accidents and wastes and have touched upon the vital part it can play in increasing much needed production.

Good lighting touches our daily life so intimately and has such great possibilities for positive value to us, that it deserves more careful consideration than it has received in the past. Invention and development, both in the generation and application of artificial light, has been so fruitful in the last quarter century that proper artificial illumination is now within the reach of the vast majority. The cost is comparatively low and the information on how to obtain it is available if the user will take the pains to obtain it. Architects, decorators, lighting specialists, lighting equipment dealers and contractors should be in a position to advise the user with reference to his lighting.

The authors feel that this paper would be incomplete, if it did not contain a word of suggestion to those interested in the sale of light, or the means of obtaining it. The seller's best interest is served by serving the interest of the ultimate purchaser, the user. It is the consumer of lighting equipment to whom proper lighting is of the most value. It is, therefore, to the seller's profit to help the user obtain what he should have, proper illumination. He can do this only if he is acquainted with modern lighting furnishings and the latest practice. The underlying fundamentals of good lighting are so well known today and this knowledge is so easily obtainable, thanks to the Illuminating Engineering Society, and the larger companies selling lighting energy and equipment, that there is little excuse for those interested in the sales of lighting equipment to not be in a position to give sound advice to the user.



An enterprising dealer, N. W. Mentz, has opened an electrical shop in the busy Commodore Concourse of the Grand Terminal, New York City, where many thousands of people pass through on their way to and from the trains each day. The commuter stops in the morning and picks out a new fixture for his living room, and stops in the next evening and takes the package home. Space is necessarily limited and expensive, and window displays must be exceptional and attractive.



## Co-operating with Architect and Builder

BY GARNETT YOUNG

(One of the greatest hindrances in the development of the electrical home, and one which has been too little realized up to the present time, is the absence of baseboard receptacles in the average dwelling. How the cooperation of builder and architect is needed to remedy this condition is analyzed in the following paper, to be presented at the Pacific Coast Section, N. E. L. A., Convention in May. The author is a member of the Garnett Young Company of San Francisco.—The Editor.)

As it is well known to all members of the electrical industry, there exists today a very active and growing demand for electrical devices and appliances of varied domestic types and usefulness. This demand has lately far outstripped production, and the shortage is most acute in the case of the labor saving group. Of course, this is building upon a very solid foundation. What is there in the wide world more desired by the average human being than to escape the hardships of physical labor. The well to do and wealthy have long been accustomed to accomplish this by the hiring of servants, but in the present domestic problem, such help is scarce indeed, so the obvious alternative is to utilize what labor saving devices may be obtainable, and here we have the first explanation of the phenomenal impetus given of late to the demand for washing machines, ironing machines, dish washers and vacuum cleaners. The increasing publicity has brought these labor savers to the attention of the humbler families, and now many a good housewife, who never aspired to the luxury of a servant, saves both her back and her strength by utilizing electricity's latest reliefs to household drudgery. So no longer can we associate electricity in the home merely with lights, or with the now altogether common articles of convenience, as flat-irons, toasters, percolators, heaters, etc., for the field has broadened again and dire necessity, not mere convenience, is now served by these modern inventions, which, indeed, constitute a boon to the human race.

Occupying such a place in the daily routine of life, it then behooves each of us in our own industry and associated vocations and professions as well, to bring these labor savers and comforts of electricity within reach of the greatest possible number of users. The field has only been scratched (the saturation today is estimated at about 10 per cent) and the demand, heavy as it is now in relation to production, we all must realize is meagre compared with what it will be in the future if intelligent and effective effort is put forth to clear the track of known obstacles.

### Obstacles to Progress

Let us then consider the obstructions. Ask any electrical dealer what limits most his sales of appliances and you will almost always get the same answer, i. e., the premises are not wired to accommodate the articles and, moreover, in the case of washing machines, ironing machines, dish washers, and ranges, no space has been provided in laundry or kitchen in which to locate them. The buyer then faces the expense of alterations and additional wiring which, to the average housewife, seems extravagant and perhaps prohibitive, and which, we must admit, is all out of proportion to what the cost

would have been had these simple requirements been provided when the house was built. (The author of this paper has a neighbor who has just installed in his living room two flush wall receptacles to accommodate respectively a piano lamp and a portable lamp, and the cost of the two outlets was \$24.70. Most of us can cite cases of this kind, involving much greater and more disproportionate expense, which have come under our observation.) Although the prospective buyer may have been sold on the electrical idea and really wants the device, being willing to pay its purchase price, there is a psychological reaction and revulsion of feeling on the point of paying, in addition, the cost of remedying the result of someone's neglect or oversight that now blocks the way. With a feeling akin to resentment, the prospect may throw up her hands and decide to do without, consoling herself with the thought that she cannot afford such an outlay. (As a matter of fact, she is deceiving herself because she cannot afford, regardless of the price, to do without a means of saving herself daily labor or providing increased comforts.) You can imagine how this situation is intensified if the prospect is not the owner but merely a tenant of the house and must, therefore, pay for wiring and outlets to be permanently installed in her landlord's premises. There is a point where human nature revolts at imposition. Why, then, we are now entitled to inquire, is not the home, whether house, flat or apartment, properly wired in the first place to avoid such complications? We are coming to that.

Practically all living abodes (houses, flats and apartments) are designed not by the ultimate owner or tenant but by an architect or building contractor, hence these vocations become a link in the chain of our troubles. No sooner do we start out to investigate why the architect and builder slight the electrical requirements of a home than we uncover some bonafide alibis to any charge of neglect brought against them.

### Misusing the Lamp Socket

The first invasion of the home by electricity, and this was the only domestic development for many years, was in the field of illumination and to this day electric light means a lamp and a socket just as it did in the beginning. Later came switches



THREE IS A CROWD, when you want to attach three appliances to the same lamp socket —

AN OUTLET FOR EVERY APPLIANCE







The world was a long, long while in bridging the span from the flickering wax candle to the carbon filament, but once there, and with electricity in the saddle, we have rapidly progressed. Now the people want and demand in their homes not only perfect illumination, artistically provided, but all other available comforts and particularly labor savers in the daily routine of domestic grind, namely—heating, ventilating, cooking, dish-washing, house-cleaning, laundering, etc. We are not picturing a dream of the future but a reality of today. Let any skeptic investigate the facts and learn to his amazement of the mounting millions of dollars invested annually in these goods by householders.

### Co-operation As the Solution

If the foregoing may be taken as establishing our premises, that is to say, a need for cooperation between the electrical industry and the allied professions of architect and builder, then let us endeavor to summarize our case and specifically set down the things we want of the architect and builder to accomplish which we are tendering our offer of co-operation. The objects sought are:

**First.** A complete wiring installation in each new house (and this would include all living abodes) providing, first, for illumination on a liberal and decorative scale, and, second, for the utilization of electrical devices and appliances—the householder being the beneficiary of this foresight at normal cost.

**Second.** The specification and actual use in these wiring installations of materials of known quality thus insuring to the consumer maximum reliability of service and reflecting credit upon the electrical industry.

The subject allotted for this paper, you will note, takes an interrogative form "How should the electrical industry co-operate?" We have now reached that stage of our discussion where, with our objectives defined, we may proceed to a consideration of the best and most practicable means of attaining same.

Let us first and forthwith dismiss the old idea of each manufacturer going at it single-handed. For years the architect and builder have been besieged by individual manufacturers in the interest of their respective products but such solicitation could hardly be regarded as co-operation, rather the reflected activities of self-interest demonstrated in the usual commercial style. There is no doubt at all but that this competitive scramble for the good will of the architect and builder has done a lot to acquaint these professions with the individual brands of wiring materials. It is equally certain that this incessant solicitation is largely responsible for the reputation which these professions bear as to being hard to approach or get at.

It is to be hoped that we shall be immediately able to convince Mr. Architect and Mr. Builder that the idea of co-operation **now in our mind** is something entirely different, founded on the constructive and enduring principle of better service to the public comprising the people who are first the clients of the architect or builder and immediately there-

after the patrons of our industry. Moreover, the present appeal is shorn of individual selfishness in that it comes not from the manufacturer alone but from a united industry embracing manufacturer, jobber, contractor-dealer and central stations.

### Attacking the Problem

An outline of a suggested procedure follows:

**First.** We must let the architect and builder know what we want and the suggestion is made that the electrical industry state its case briefly and offer its co-operation through the medium of advertisements placed in the respective magazines or publications of these professions. This would be the opening gun and should not be fired until the rest of the plan is ready to be put into operation.

**Second.** It is suggested that different sets of typical wiring plans be prepared, suitable respectively for one-story residences, two-story residences, and apartments; that these plans clearly locating all outlets, be incorporated in a pamphlet with just enough reading matter to make simple explanations. The pamphlet should be in attractive, even artistic form, showing interior views of rooms with everything in the way of furniture and fixtures in good taste, and on the page opposite to each of these pictures should be a diagram indicating the position of outlets necessary according to the latest good practice. Such a pamphlet should be entirely suitable for an architect to hand over to a client as a basis of study and decision on the electrical requirements of the home. Leading to this purpose, it would be well to briefly emphasize two points, namely—the economy to the owner or tenant by having the wiring provided in complete fashion as a part of the original work, together with the unquestionable value to the premises, either for sale or for lease, by the inclusion of such electrical facilities with their strong appeal to every housewife. This pamphlet should be placed in the hands of every architect and builder in the Pacific section with the advice that additional copies may be had for the asking.

**Third.** Field men of ability and training should be employed whose business it would be to make personal calls upon architects and builders and with the above described pamphlet in hand review its picture story and satisfactorily explain any application not clear or not fully accepted. At the same time this expert should acquaint his man with the merits of the present offer of co-operation from the electrical industry, reaffirming the premises hereinbefore set forth. It is believed that interviews of this character, undertaken by high class men, will lead to a better understanding with results pleasing not only to the architects and builders but to their clients.



A CONVENIENCE OUTLET turneth  
away wrath—

AN OUTLET FOR EVERY  
APPLIANCE



**Fourth.** It is recommended that a substantial proportion of the local newspaper advertising done by the central stations and contractor-dealers, in their appeal to the public, be concentrated on the complete wiring of the home. Such copy should occupy perhaps a half-page of the paper and contain the floor plans clearly diagramed with the location of washing machine, ironing machine, electric range, dishwasher, vacuum cleaner and sewing machine, etc., with respective outlets, indicated just as boldly as the location of the bath tub or kitchen sink. As a matter of course, outlets should be indicated for the accommodation of various table devices employed in the dining room and the kitchen, also for electric heater in the living room, bath room, etc. As for lights, the outlets for piano lamp and table portables would be as prominent as the outlets for the customary ceiling and wall fixtures. The advertisement should be topped with directions that would cause the prospective home builder to cut it from the newspaper and keep it against the day construction would start. Each and every one of these ads should carry the injunction to use only high class material to insure reliable service and ultimate economy. These same floor plans, accompanied by a modified appeal, should be occasionally run with the object of accomplishing the wiring of old homes, the owners or tenants of which being shown that extensions by means of surface raceways are neither unsightly nor very expensive. Better resort to this remedy than go without electricity's aids.

**Fifth.** Electrical manufacturers, particularly those producing devices and appliances for domestic utility, do a great deal of national advertising. Arrangements should be made insuring that each and every one of these ads carry some uniform slogan which might read about as follows and be blocked off in form to attract the reader's attention:

"Wire the home complete for sufficient, convenient and decorative illumination as

well as for the use of modern labor-saving appliances. Enjoy the comforts of electricity. Insist on quality materials throughout."

An advertisement including this feature will sell the electrical idea to the public because it carries a broader and more effective appeal than one devoted wholly to proclaiming the exclusive virtues of the advertiser's own goods. We want team work in this national advertising for the advancement of the general cause.

**Sixth.** It is recommended by the Commercial Committee, responsible for this paper, that all of the foregoing suggestions be taken in hand and exploited by the California Electrical Co-operative Campaign, which functionary has already demonstrated its ability to cope with such problems. That institution has available part of the machinery for carrying into effect this program and should be equipped with necessary funds to round out its complement for energetically undertaking the work. The Co-operative Campaign is representative of and supported by all branches of the industry which facts qualify it to best serve as the go-between for the industry and two allies whose thoughtful interest and help we desire to obtain.

Finally, reviewing our six recommendations, it is observed that half of them are devoted to specific ways and means of assisting the architect and builder in holding up their end of the responsibility in the domestic application of electricity, with their clients as the ultimate beneficiary. In the remaining recommendations, we outline the steps which the industry will take to reach the public direct, thus lightening the burden of educational effort falling to the lot of the architect and builder. All the expense of the several activities to be assumed by the industry which only asks the architect and builder to accept in good spirit its tender of constructive co-operation.



The Grand Electric Company of Portland, Oregon, have just remodeled their store front as shown in the photograph. This company, which has been in business over ten years, specializes in lighting fixtures but also does general merchandising and wiring.





A young fig orchard in Fresno county irrigated from underground sources through the aid of electric pumping. The permanency of the water table not only affects the power company directly in the maintenance of their pumping load, but the entire prosperity of the thriving agricultural districts they serve.

## The Permanence of Electric Pumping in California

BY CHARLES H. LEE

(The electric pumping load is a large and profitable one in the drier districts of the West, but in undertaking new enterprises of this kind it is necessary for a power company to be assured of the permanency of the underground water supply. Some of the conditions which affect these natural reservoirs, together with consideration of actual practice and state regulation, are here discussed by the president of the California State Water Commission.—The Editor.)

The past twenty years have witnessed a phenomenal growth in the use of ground waters for irrigation. This commenced in Southern California during the dry period from 1898 to 1905, when the force of circumstances compelled the search for sources of underground water to supplement the diminished surface supplies. The success attained by these early efforts led to continued use and further development after climatic conditions had returned to normal in 1905. At the present time between one-third and one-half of the irrigated area of Southern California depends upon ground water supplies derived from wells.

### Changes in Pumping Equipment

Irrigation development in the San Joaquin Valley has been very rapid since 1900, and following the practice in Southern California, ground water supplies have been largely drawn upon for extending the irrigated areas. The proportion of the total area irrigated from wells in 1912 was ten per cent, and at present exceeds fifteen per cent. The use of underground water in the Sacramento Valley has not been extensive, but with the growing recognition of the benefits of irrigation and use of normal stream flow the day is not far distant when underground supply will be given attention.

With the increased use of ground waters there has been a change in source of power for pumping. The internal combustion engine or steam plant was most common in the earlier years of irrigation pumping. It could be set up quickly, without the delay and expense incident to securing connection with an electric transmission system laid out primarily for a municipal load. As time went on, how-

ever, the value of the irrigation pumping load was recognized by the hydroelectric public utilities. Transmission lines were built into pumping districts and changes were made in standard electrical equipment, adapting it to the special requirements of the new service. The convenience and reliability of electricity as a source of power soon won general favor, especially among small consumers, even where the expense was greater. The disproportionate increase in the price of fuel oil during the past few years, together with State control of public utility rates and service, has operated in favor of electricity in the matter of cost.

### Influence on Load Curve

The result has been an entire change in the character of the central station load curve, not only the daily curve, but the annual. The daylight trough has been filled during the irrigation season and the summer trough in the annual curve has been replaced by a ridge. The latter condition is not a disadvantage. The irrigation pumping load corresponds in proportionate amount and time to the use of gravity irrigation water. Hence, the greatest source of conflict between irrigation and power interests is disappearing, and in its stead is an opportunity for cooperation in storage of flood and winter waters.



THE EARLY WIRER catches the electric appliance —

AN OUTLET FOR EVERY APPLIANCE



The accomplishment of this storage is one of the most pressing problems now facing the people of the state.

The large and rapidly growing volume of business represented by the irrigation pumping load brings with it an added responsibility to the corporation management.

### The Factor of Ground Water Supply

In the early years of ground water development the adequacy of a new well or group of wells as a source of supply was considered assured if the test yield was large and attained without serious draw-



With the increased use of ground waters electricity has won out over other sources of power for pumping, owing to its convenience and reliability. This is an instance where a gas engine replaced a windmill as a source of power, and both have been superseded by an electric motor.

down of the water level. The success of one development led to others and before long whole orchard districts and communities were laid out depending entirely upon the local ground water supply. In such a district the business of a power company for all purposes depends largely upon the permanency of the ground water supply. Experience has shown that there are practical limits to ground water development, and with too great withdrawals, extensive and permanent lowering of the water levels occur over more or less widespread areas. In one outstanding instance in the San Joaquin Valley, a large area of highly developed land has been forced to take drastic measures in order to continue its present state of productivity and community life. Other districts are observing marked lowering of water levels from year to year, and may have to take similar steps unless the return of normal climatic conditions with increased rainfall and runoff relieves the situation.

A hydroelectric power company going into a new pumping territory or planning for increased business in one already occupied cannot afford to disregard the question of the future permanency of the ground water supply.

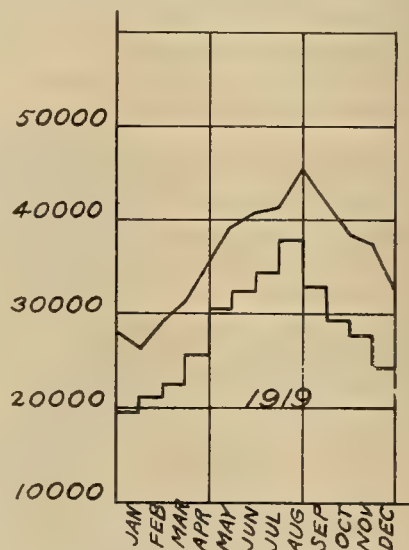
### Estimating Water Resources

The mystery and uncertainty which formerly prevailed with regard to the occurrence and movement of underground water has to a large extent been dissipated. It is today even possible, by means

of scientific observations and study, which can be conducted by the specially trained hydraulic engineer, in many cases to make quantitative estimates of the amount of ground water available for development in a given district. This progress has resulted largely from the demand for information required for complete utilization of ground water resources in the southwestern states, but particularly in California. The scientists of the Ground Water Division of the Water Resources Branch of the U. S. Geological Survey have done much to bring information together and formulate general principles and terminology, but the initiative has been taken and the pioneer work done by the practical hydraulic engineers of the Southwest. These men have opened a new field of engineering endeavor, one which has been recognized in Europe, and especially France, where its practitioners are termed L'Ingenieur-Hydrologue. In America the work of the hydrologic engineer is based upon a broad foundation of data and practical experience. The management of hydroelectric enterprises, therefore, does not necessarily face an indeterminate problem when considering the future behavior of ground water levels in a given district, but may obtain technical advice of recognized value from the trained "ground water hydrologist" or "hydrologic engineer."

### Underground Reservoirs

The economically important ground water supplies of California are extracted from porous and usually unconsolidated accumulations of gravel, sand and clay. These deposits occupy geological depressions or basins in the earth's surface and are usually found beneath valley floors and occasionally bordering lakes or bays. The extent and depth of these deposits vary, depending on the area and depth of the geologic depression or basin which they occupy, the amount of available rock debris in the adjacent



Typical load curve of power company serving irrigation districts. The growth of electric pumping has made the summer load a peak rather than a valley. The power company and the irrigationist are today cooperating in encouraging mountain storage for winter waters.

hills or mountains and the activity of the streams engaged in the work of transportation. In the case of the Sacramento and San Joaquin valleys, the deposits cover several thousand square miles, but have



many subdivisions forming relatively small local ground water districts. The coast and southern California valleys are generally small, few exceeding 100 square miles.

The deposits of porous water-bearing materials are usually surrounded by relatively non-porous formations. The latter are represented by the encircling or bordering hills, thus forming enclosed subterranean basins or reservoirs. In fact, the resemblance is so great that the term "underground reservoir" has come into general use by engineers and the courts. As suggested above, these underground reservoirs may not always correspond in extent to the valley floor. In fact, because of buried hills or ridges or differences in porosity, or alluvial material at different distances and directions from the point of discharge of large streams from the mountains, a valley may be divided into a number of almost independent underground reservoirs. It is the first step in any investigation of ground water to determine the limits of each underground reservoir in the area being studied, for each must be considered as a separate unit in its behavior with pumping.

#### Inflow and Outflow

Carrying the reservoir analogy further, it can be readily appreciated that in order that a permanent ground water surface or water table may be maintained, there must be a continued or recurrent source of supply and that no more water can be withdrawn from an underground reservoir than enters. These are the basic principles upon which quantitative estimates of ground water supplies are made. They are also the requirements upon which permanency of ground water supply depends.

The principal source of supply of underground reservoirs is runoff from rainfall and snowfall on the adjacent hill and mountain slopes. This water flows out upon the valley floor from various canyons and is more or less absorbed by the underlying porous material, either directly from stream channels and ditches, or from irrigated areas. The importance of the latter is indicated by the observed rise of 50 feet or more in the Fresno district since the practice of irrigation commenced.

The water thus absorbed sinks to the general water plane and moves slowly toward the lowest part of the valley. Some escapes at springs and seepages into natural channels, a small amount may escape as underflow, but the largest part is lost by evaporation from moist soil and vegetation. The latter occurs from cultivated crops, natural swamp vegetation, or from damp alkali-crusted land. Pumping from wells is an artificial avenue of escape of water from an underground reservoir.

The relation of inflow to outflow for an underground reservoir as for a surface reservoir is registered by the vertical movement of the water surface. Rising water level or increasing artesian pressure indicate an excess of inflow; falling water level, or decreasing artesian pressure, indicate a deficiency. The adjustment of differences between outflow and inflow caused by climatic variations or artificial changes, such as introduction of irrigation or extrac-

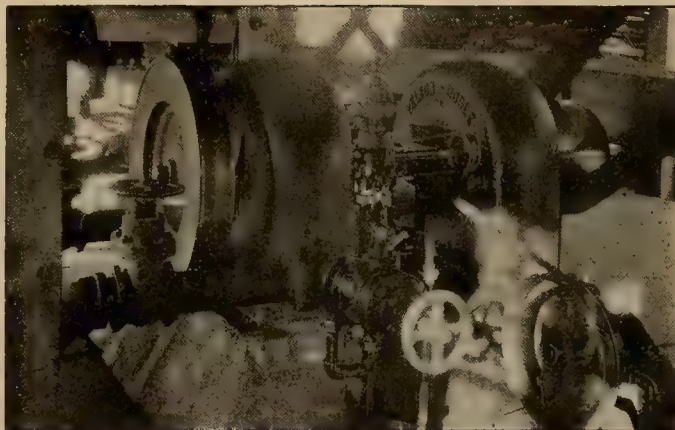
tion of ground water by pumping from wells, is accomplished by the increase or shrinkage of the evaporating area and of overflow into natural channels. The determination of the quantitative limit of development from an underground reservoir involves not only observations of ground water level fluctuations, but must also be considered from the broader relation of inflow to outflow. In instances where pumping draft and residual natural losses by evaporation and seepage into streams exceeds normal inflow, there will be persistent lowering of the water level and ultimate abandonment of pumping from at least a portion of the district. It is this situation which should be avoided by the exercise of foresight before the investment has been made.

### WATER WHEELS FOR BRAKING AND INITIAL POWER

BY CHAS. H. TALLANT

(How inconveniences of location were overcome by an interesting installation, making use of the available water power, is here described by a member of the Pelton Water Wheel Company of San Francisco. —The Editor.)

An unusual and unique use of water wheels has been made in a California installation, at the Plumas County plant of the Spanish Peak Lumber Company. The installation is on the company's timber project,



A water wheel installation on a timber project furnishes the power for an aerial tramway and drives a generator for lighting purposes

where water power is available but direct access to the railroad impossible. Two Pelton water motors, set in opposition, have been adapted to an aerial gravity tramway control to furnish power and braking effort as well as to drive a generator for lighting purposes. The motors furnish all the primary power for the cableway and the braking effort when the cableway is loaded.

The cableway is fundamentally a gravity system, but due to the difference in elevation of the



MANY CONVENIENCE OUTLETS  
make light work —  
AN OUTLET FOR EVERY  
APPLIANCE



loading and discharge station and the length of the cable, power is required for braking when loaded carriages are hung on the way, and for driving the tramway with the cable unloaded. The cableway has a total length of 27,200 feet, crossing a ridge of 4,900 feet elevation between the loading station at the mill and the discharge station at the railroad right-of-way, while the discharge station is 890 feet lower than the loading station. A braking effort to absorb a maximum excess of 12 hp. is necessary when the way is fully loaded, and a torque of 20 hp. is required when the cable is not loaded.

Two 24-inch Pelton water motors, rigidly connected in opposition through a solid coupling, make up the driving and braking unit. They are controlled by needle nozzles, actuated by oil governors, in regulating the cable speed, regulation being to hold speed constant. The governors are so adjusted that when the cable slows below normal speed due to a light load, water is admitted to the driving motor, and power is generated to hold the speed

constant. When the cable is loaded and the speed tends to increase, the water is shut off the driving motor and admitted to the braking motor. The impact of the buckets of the braking motor rotating against the jet develops the requisite braking effect and holds the speed normal.

Water for the system is taken from an old mining ditch above the mill, with an effective head of 230 feet. Several smaller motors are energized by water from the same supply, for driving small utility machines in the mill. Electricity for lighting the mill and other buildings is generated in a 15 kw. alternator, belt-driven from the flywheel of the main water motor unit. Fire protection is also provided by water from the ditch.

The handling costs for the cableway have been well under the contractors' guarantee of \$2.40 per M. board feet and operation has become so successful that the company's entire stand of 200 million feet will be moved to the railroad at lower than that figure.

## Storage Battery Locomotives in Hetch Hetchy Tunnels

BY PAUL J. OST

(The Hetch-Hetchy project is notable not only for its extent as a water and power scheme, but for the variety and completeness of the equipment which is being used in its construction, the locomotives described below being among the examples of this. The author of the article is electrical engineer with the Bureau of Engineering, City of San Francisco.—The Editor.)

The City of San Francisco on its mountain development of the Hetch Hetchy water supply is driving 18.3 miles of continuous tunnel through solid granite. This tunnel is to be lined with concrete and will be 10' 3" x 10' 3", the section being a horse-

length of most of the tunnel sections would necessitate the use of 600-volt direct current if overhead trolley were used, requiring that the concrete and form men work adjacent to a fairly high potential. In order to support the trolley some type of fastener would be required in the finished concrete lining.

### Type of Locomotive

After carefully weighing all conditions, it was decided to purchase six electric storage battery locomotives, one for each section of the tunnel. The locomotive selected weighs 6,000 pounds without battery. It is equipped with 80 cells of Edison A-6 Battery, which, with the container, weigh 1,800 pounds, making a total weight of 7,800 pounds without driver. The average voltage on discharge is 85 volts, while the maximum voltage necessary to charge is 150 volts. The track gauge is 24 inch. The over all length of the locomotive is 10' 5 $\frac{3}{4}$ " with a width of 44" and a height of 42". The rated drawbar pull is 1,200 pounds with a maximum pull of 1,600 pounds during acceleration, which permits handling trains weighing 50 tons, the corresponding empty car train weighs 15 tons. The selecting of the battery capacity and charging equipment was based on eight 5-mile trips in 24 hours, 21 $\frac{1}{2}$  miles being the greatest distance from portal to the heading. The running time will consume eight hours out of the twenty-four. After making two round trips it would be necessary to recharge the batteries. The operating time indicated would allow sixteen hours out of each twenty-four for charging. When drawing a 50-ton trailing load the locomotives will make 3.9 miles per hour against the tunnel grade—0.15%. The speed increases with lesser loads, the locomotive light making eleven miles per hour.



Electric train at Early Intake Tunnel. The daily mileage of one of these locomotives is from 10 to 40 miles; the loads average about 4,500 pounds each, and one locomotive will handle from 30 to 60 each 24 hours, according to the work done on the tunnel.

shoe shape. The rough tunnel is approximately 11' 6" x 11' 6". One division will be almost five miles in length without shaft or adit, necessitating the hauling of excavated material a maximum distance of 21 $\frac{1}{2}$  miles.

It will be necessary to haul into the tunnels forms, tools and workmen for the concrete lining in addition to removing the excavated material. The concrete will no doubt be conveyed through pipes by compressed air from the portal. The great



Two very significant things were brought out in the selection of the locomotives: First, very much more efficient and satisfactory operation could be secured by equipping all cars with roller bearings, thereby making the train resistance 15 pounds per ton loaded, and 18 pounds per ton light. Second,

which contains, in addition to the charging equipment, work bench and supply cupboard, a track elevated above the floor onto which the locomotive is run by its own power up an incline which lies outside the building. This elevated track permits the caretaker to work under the locomotive applying grease and making inspections, thus eliminating any chance for neglect due to inaccessibility.

### Working Capacity

At the present time the maximum haul for any locomotive is between four and five thousand feet. This includes a short run out on to the dump. The daily mileage of a locomotive at present varies from 10 to 40 miles. The number of loads varies with the work done on the tunnel, running from 30 to 60 each twenty-four hours. These loads will average 4,500 pounds apiece, which includes 1,500 pounds for the car. The work at the present time is necessitating a great many trips of the locomotive light, carrying men and tools. So far, the indications are that the power consumption per ton mile is 120 watt hours measured at the motors, or 300 watt hours measured as a.c. power at the motor generator set, which compares very favorably with the a.c. power required to operate a trolley equipment using a motor generator set for converting the a.c. to trolley current. Conditions are improving all the time, and it is thought that the service under which this record was made is possibly the most unfavorable which will be encountered.

### Satisfactory Operation

The operators are selected from the tunnel gangs, being the most capable of the ordinary tunnel laborers, and after a few days' instruction are placed in charge of a locomotive. So far everyone is extremely well pleased with the operation of the equipment. It might be thought that electric locomotives operating at a minimum speed of 3.9 miles per hour and requiring several hours a day for recharging, would be altogether too slow. Such, however, is not the case, the maximum and intermediate speeds proving ample for all conditions, and when hauling maximum loads, safety demands slow speed.

Another feature which has won approval for the locomotive is the fact that it has sufficient power to move either the air-operated heading machine or the electric-operated shoveling machine. Prior to the advent of the storage battery locomotive there was always considerable difficulty experienced in taking these machines in and out of the tunnels. Since April, when the locomotives were placed in commission, there has been no such complaint.

In addition to operating in tunnels opening at portals, two locomotives will be used at shafts. The shafts are 4' 6" square and the locomotives were de-



Battery charging equipment at Priest Tunnel. The motor-generator set and the charging panel are mounted in one corner of the special locomotive house.

good track was essential to efficient and fast operation. It was therefore decided to install 30-pound rails, with angle bar splice plates, on wood ties with rock ballast.

The locomotives purchased were built by the General Electric Company. Each is equipped with two H. M. 828 ball bearing motors which are to all appearances miniature street railway motors being connected to the axle through the standard form of railway single reduction gearing, the pinion and gear being enclosed in a malleable iron gear case.

### Charging Equipment

In order to insure proper charging without employing experienced men each locomotive is equipped with a Sangamo ampere hour meter, which runs forward on discharge and backward on charge, the ratio between the operation forward and reverse being such as to compensate for the battery efficiency. The zero position is equipped with an auxiliary contact which not only opens the d.c. circuit breaker, but also trips the a.c. starting compensator, shutting down the motor generator set automatically upon the completion of charge. The motor generator set is of 15 kw. capacity and consists of a 440-volt, 3-phase induction motor, direct connected to a 150-volt d.c. generator. This, together with a charging panel, is mounted in one corner of the special locomotive house, which consists of a small building



MAKE TOAST while the lamp shines —

AN OUTLET FOR EVERY APPLIANCE



signed so that the battery compartment can be lifted off, permitting the chassis to be dropped down the shaft end first. The batteries will have to be taken out of the compartment and sent down in their crates, after which the housing will be lowered in a similar manner to the locomotive. The design of the locomotive also will permit of readily removing a discharged battery, replacing it with a freshly charged one. The present indications are that it will be unnecessary to resort to any such expedient.

It is impossible at this time to give any data on the cost of operation and maintenance other than is indicated above. Three locomotives have been in continuous service since April, 1919, without it being necessary to spend anything for repairs or renewals. As water can be obtained out of the river of sufficient purity for use in the batteries, there has been no expense for distilled water. The amount of oil and grease used is very small. In six months more it will be necessary to wash out and refill the batteries with new electrolyte. It is impossible at this time to estimate what this work will cost.

The tunnel aqueduct is being constructed by day labor under the direction of M. M. O'Shaughnessy, City Engineer of San Francisco.

## Western Ideas

AN EFFECTIVE USE OF THE WINDOW to promote public good feeling was carried out by the city of Los Angeles in conjunction with the power development on the Los Angeles aqueduct. Photographs of the project were neatly mounted and dis-

played in the window, together with an attractively printed poster giving the details of the project. It was found that considerable interest was shown in the display by passers-by, who undoubtedly went on their way with a more intelligent understanding of the vastness of the undertaking and a better comprehension of the problems involved in supplying them with water and power. It has not been customary for power companies to take advantage of the advertising value of their window space, but there is no reason why this method of reaching the public should not be added to the growing belief in publicity of all kinds.

### A FREE ELECTRIC LAUNDRY

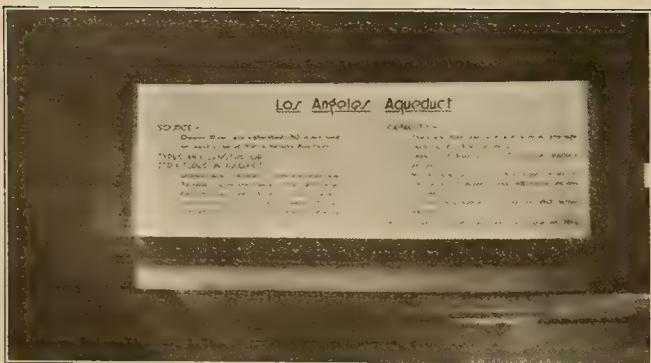
A free laundry, where anyone may come to do washing, is a notable enterprise undertaken by the Domestic Appliance Company of Oakland, Cal. A commodious room adjoining the Domestic Electric



To this model electric laundry any housewife may bring her washing and reduce her labor by the use of the up-to-date electric appliances. Here are an electric washer supplied with plentiful hot water and soap, electric wringer and electric iron, all accessible without charge.

Appliance Company's sales room at 1533 Clay Street, has been rented and converted into a complete and thoroughly modern laundry plant. It is equipped with every up-to-date mechanical and electrical device which may be employed in facilitating laundry work and all appliances are so arranged to afford the utmost convenience for the operators. There are electric washing machines, electric drying machines, electric mangles, electric irons and ironing boards. In addition to furnishing the complete mechanical equipment, the Domestic Electric Appliance Company supplies the electricity, gas, hot water and soap—all absolutely free of charge. An intelligent courteous attendant instructs those who are unfamiliar with the workings of the various mechanical and electrical devices in the operation of the appliances.

The Domestic Electric Appliance Company cordially invites every one who has experienced any difficulty in having their laundry work performed to take advantage of this extraordinary opportunity.



A window display which gave information to the public

played in the window, together with an attractively printed poster giving the details of the project. It was found that considerable interest was shown in



## Electrical Co-operative Advertising Campaign

(Through advertising, the public should be made to realize that California cannot grow industrially, any faster than its hydroelectric power is developed, and transmitted to its cities. The following tells something of the constantly increasing publicity given to the electrical industry in the California newspapers under the stimulus furnished by the cooperative advertising movement.—The Editor.)

"Electrify California" was the dominating note of the recent big meeting of the Los Angeles advertising club, when the plans and partial results of the immense cooperative advertising campaign being run in California were laid before the members of the club. At the conclusion of the meeting President Ray E. Nimmo, and director A. H. Wilkins, of the Better Business Bureau of the advertising club, together with visiting representative advertising men from the various parts of the United States, stated that in their opinion this cooperative electrical

interested in the advancement of hydroelectric development, and in bringing before the public the many modern uses of electricity.

### Electricity and Community Development —

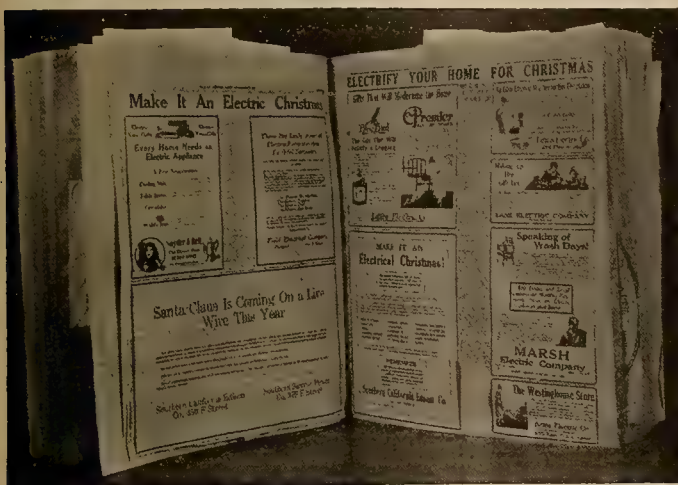
Carl M. Heintz, promotion representative of the Westinghouse Electric & Manufacturing Company, in speaking at this meeting maintained that "We, of California, must realize that we cannot grow industrially, or our population increase beyond certain limits, faster than our hydroelectric power is developed, and transmitted to our cities for industrial and domestic uses, and to our farms for agricultural purposes."

At the present time millions of acres of semi-arid lands are lying idle awaiting intensive cultivation, while literally thousands of eastern manufacturers are looking forward to establishing factories in California, when sufficient hydroelectric power is available. The California power companies who are lending their untiring efforts to develop sufficient hydroelectric power to meet this ever increasing demand, conservatively estimate that \$250,000,000 will be needed to develop sufficient power in California in the next ten years, half of which will be spent in our own state for wages, raw materials, and manufactured products. This means a great deal to individual business, since this development will undoubtedly double the population of our state within the next ten years.

### Organizing Publicity —

One large manufacturer recently estimated that there is a ready market in the United States at the present time for seven billion dollars' worth of electrical appliances. The electrical industry is doing much to acquaint the public with these facts, chiefly through the California Electrical Cooperative Campaign, an association made up of manufacturers, central stations, jobbers and dealers, whose efforts are responsible for the launching of an extensive advertising campaign in the state of California.

At the present time there is a considerable amount of local and national advertising being done by various branches of the electrical industry. The central stations and electrical dealers are being induced to advertise on one page once a week, tying in with the national advertising of the manufacturers to create a smashing effect, and showing the house-



The returns from the Christmas advertising campaign in Southern California astonish even the experienced advertising men of our country, especially the figures showing the volume of publicity secured, in relation to the advertising placed, the average for the entire campaign being approximately 20%.

advertising campaign was one of the largest intensive advertising campaigns ever started in any section of the United States.

### Surprising Figures —

The total figures of the Christmas advertising campaign in southern California astonished even the experienced advertising men of our country, especially the figures showing the volume of publicity secured in relation to the advertising placed, which ran as high in some cases as 50%, the average for the entire campaign being approximately 20%.

In the state of California the electrical industry ran, during the campaign, over 300 full pages of electrical advertising a week. In San Francisco district the campaign worked on a somewhat different plan, the dealer signing up on a six months basis, and even though not as big a smash effect was secured for the Christmas campaign, the average for the six months compares very favorably.

In the city of Los Angeles the volume of publicity secured averaged 25% of the advertising. A consideration of the metropolitan character of the Los Angeles newspapers, which run a higher average of advertising to reading matter than practically any other newspapers, shows that the press is vitally



TOO MANY inconveniences spoil the labor saving device —

AN OUTLET FOR EVERY APPLIANCE



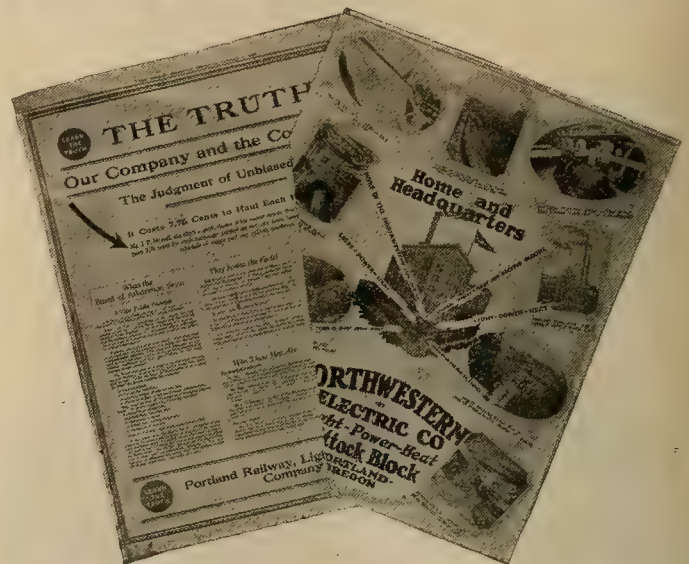
wife where the electrical appliances she sees advertised nationally can be purchased locally; the ultimate idea of the committee being to establish an electrical section in every newspaper of California, similar to the automobile section. Men interested in the promotion of this campaign have called on practically every electrical dealer, central station, and newspaper man in California, laying before them the plans of the campaign.

In Southern California the campaign is further advanced, over 125 full pages of cooperative electrical advertising appearing each week in the newspapers there.

The newspapers fully realize the importance of the campaign and are lending their support by giving these cooperative electrical pages such headings as, "Electrify Your Home," "Electrify California," "Electricity Means Freedom to the Housewife," together with from three to four columns of reading matter extolling the methods of electrification. This campaign is growing beyond all expectations, and next year the electrical industry expects to publish in California in the California newspapers no less than six thousand full pages of this cooperative advertising.

The campaign in Southern California has been conducted by A. L. Spring, field representative of the California Electrical Cooperative Campaign; Chas. H. Pierson, advertising manager of the Southern California Edison Company; H. C. Rice of the South-

ern California Edison Company, and Carl M. Heintz, promotion representative of the Westinghouse Electric & Manufacturing Company. It has also received the earnest support of the local electrical industry, as well as material assistance from Capt. Howard



A sample of the extensive electrical advertising being done in the Northwest, a single company taking an entire page of the newspaper. The impetus given to the publicity movement by California is making itself felt throughout the Pacific Coast.

Angus, secretary for the California Electrical Cooperative Campaign, and I. W. Alexander, chairman of the publicity committee of the Pacific Coast Section, N. E. L. A.

## Office Records—Their Filing and Indexing

BY IRENE WARREN

(There are four basic methods of filing but each is susceptible of various modifications, according to the requirements of any particular business. Some phases of the standardized systems and their application are here analyzed by the director of the Chicago School of Filing and Indexing, in the third article of the series.—The Editor.)

There are four basic ways of arranging business papers; by name (of the firms, individuals, or items), by geographic location, by subject, and by chronology.

For notation, we may use letters, numbers, or colors. All the systems on the market at the present time are based on these principles. Some of them combine two or more methods. In this short account, a few of the systems offering the purest types of the basic principles will be explained. If these are thoroughly understood, it will give the file clerk a method of analyzing any file he may see, and also of adapting these systems to his peculiar needs. It will also give office managers, department managers, and specialized workers in various lines, the method of planning their records in such a way that they will quickly yield accurate information when needed. Filing and indexing is one phase of efficiency work.

### Choice of Filing Method

Correspondence files, today, are arranged in such a manner that they index themselves. A card index is unnecessary unless a large percentage of the letters need to have a number of different entries.

One of the difficult points in filing is to deter-

mine, especially in a new business, which is the best system to use. The alphabetic name file is the most satisfactory in the largest number of business lines. A few exceptions to name entries may easily be made, for certain types of letters that are more desirable under subject or geographic location. The letters are grouped as desired and filed in one alphabetic sequence with the names.

In many ways, alphabetic filing is the easiest to understand. This is sometimes called the dictionary, or directory method, because the words are filed in similar style. Every letter of every word is taken into account in accurate alphabetizing, just as in the directory—words are not thrown together roughly by initial letters only.

### Aids to Efficiency

One of the hardest parts of filing is to know just where to enter each letter. The most intelligent clerks, with the greatest familiarity with the business, take care of this phase, and department heads often send the file clerk suggestions as to how a difficult letter will be used, when the incoming letter and carbon answer are first sent to him. Each letter is marked when the decision is made so that the letter will always go in the same place. A straight line



is drawn with a colored pencil under the name under which it is to be entered. This takes but a second as the letter is being read the first time, and saves re-reading when it is filed or returned after a loan.

The names must be written on the labels for the regular correspondents' folders exactly as they are to be filed. The label for J. C. Brown should be written: "Brown, J. C."

A file clerk when hurried ought not to be hampered by transposing names and initials. Too great care cannot be given the writing of these names, and in some of the best filing departments, the supervisor writes every one of her own labels so that she knows no mistakes occur from inaccuracies in the names on labels.

Alphabetizing is not the easy problem that so many people think it, and definite rules must be laid down for file clerks, if there is to be continuity and accuracy in the files. The rules used in the business firms differ considerably from those used in filing cards in the public library. The telephone directories in fourteen of our largest cities are being published by one firm, which has standardized the arrangement of names to a considerable extent. It is the alphabetic list with which the largest number of people are familiar, and it seems wisest to be guided by this book rather than by any other. Only a few of the main rules for entering letters and alphabetizing them can be suggested in this short account. A glance at these rules will surely indicate to the reader why so many letters are lost in files where several people are filing, each according to his own notion.

#### A Few Rules for Alphabetizing

In a name file, it is better to make the entry under the firm name than under the name of the individual writing the letter. Members of firms and individuals in their employ change frequently and the firm name is apt to be more permanent. Divisions of a firm may be made by departments, or by individuals in charge of departments, as desired.

The name of the firm or individual is inverted as shown below, so that the last name stands first.

Baxter, S. W. & Co.	Farnham, John & Sons
Bentley, John C. & Bentley, J. L.	Smith, Elmer

Firm names composed of last names of various individuals, stand as the official name of the firm as written. Descriptive titles also remain as written in official names.

Aaron-Johnson Co.—	National Biscuit Co.
Bentley, Bemis, & Doran	

Terms like Mrs., Jr., Sr., are filed after the names.

Burr, John L.	Doran, John, Jr.
Burr, John L., Mrs.	Doran, John, Sr.

In a name file, it is usually desirable to introduce a few subjects. The file clerk makes the exception that certain letters, regardless of the writer, are to be classified by subject, and a folder is made for that subject and alphabetically arranged in the file, exactly as if the subject had been a name. If a firm has a number of subjects that it wishes to keep track of,—five, ten, twenty—it does so in this way.

A subject file is not adopted unless the majority of the letters are to be classified by subject.

If a firm and a subject have the same wording, arrange the firm first.

Anderson, James, & Co.	Public Securities Co.
Applications—Bookkeepers	Public Securities—Bonds
Applications—Stenographers	Public Securities—Stocks
Applications—Typists	

A foolish little rule, "Nothing before something," has pulled many a file clerk out of a tight place. Finish the first unit for filing, before taking the next word.

Anderson	C.	H.	L. Belting Co.
Anderson, J.	C.	Chic	Store
Anderson, John		Chicago	Belting Co.
Anderson, John C.			
Anderson, John Cotton			

Enter all letters under the official name of a corporation or institution.

Chicago, Burlington and Quincy  
John Crerar Library  
Johns Hopkins University

If an institution is locally much better known under a nickname or shortened form, it may be better to keep the letters under that form, and make a cross reference from the official title to that form.

Examine the telephone book, gazetteers, and other reference books, and the public library card catalog for treatment of "St," "Mac" and "Mc," and other puzzling points.

#### Recognized Importance

Filing and indexing, as it stands today, is one of the unstandardized lines of clerical work, in many places looked down upon, and ranked below typing, while in other concerns, it has the recognition of a separate department, with a trained supervisor and specialized equipment.

Filing departments, which a short time ago were tucked off in basements, attics, or dark corners, have been brought out into well-ventilated spaces with the light needed for accurately putting away detailed records. Even if all the materials are not filed in one place, the supervisor attends to the making of the records and to their filing, so as to keep uniformity in them.

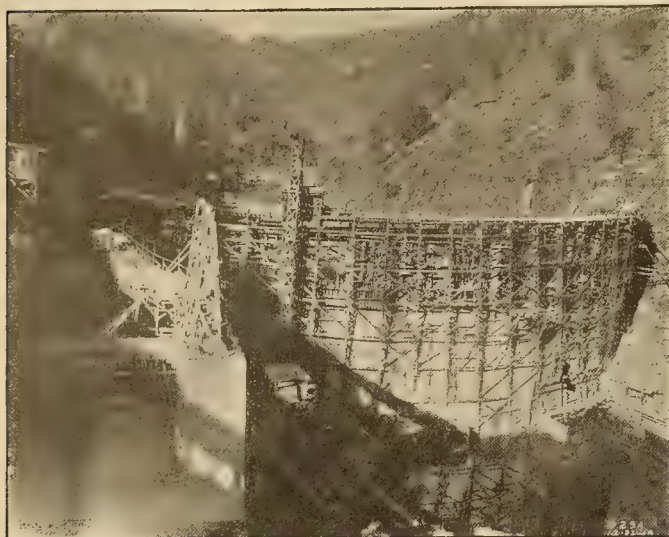
The efficiency expert, who has investigated this matter, will tell you that this costs more money for equipment, the individual salaries paid are higher, more expensive quarters are needed; but that in the face of all this, the right filing systems, properly equipped and operated, will cut down overhead expense, and give the firm the chance to do better business, perhaps even a larger volume of business; than did the old way of letting anyone and everyone attend such parts of the files as they could, when they could, and where they could.

TWO CONVENIENCE OUTLETS are  
better than one —

AN OUTLET FOR EVERY  
APPLIANCE

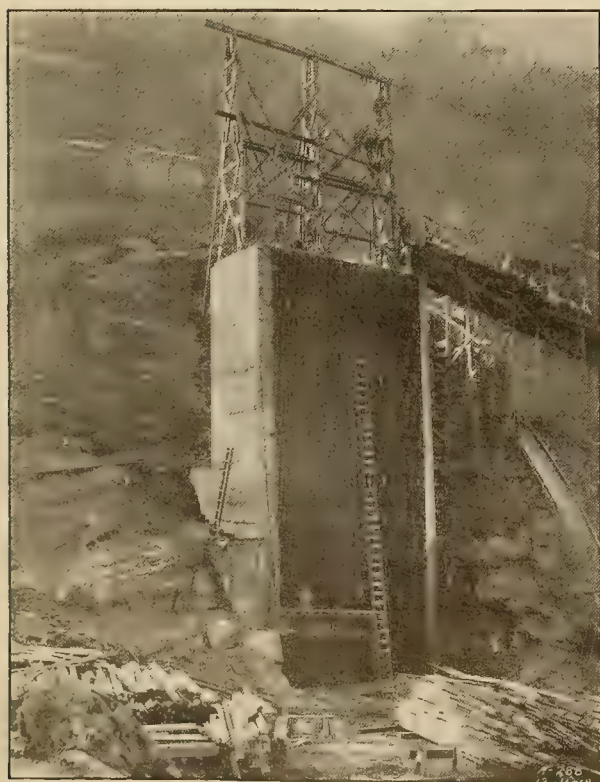


# Construction Advances on the San Joaquin Kerckhoff Project



The dam complete. All frame work has now been removed and only water enough in the river is required to fill the reservoir.

The Kerckhoff power project of the San Joaquin Light and Power Corporation on the San Joaquin River has advanced to the point where a spring freshet can now be handled without difficulty. The first work in breaking ground was done as late as May, 1919, much of the machinery being handled and work actually commenced even before it was possible to complete an incline down into the canyon. The work has been speeded in many ways—through the installation of a rock crushing plant adjacent to the dam, extensive use of steam shovels in excavation, complete shop equipment which enabled repairs to be handled expeditiously, and a three shift system



Intake gates on the pressure tunnel. This extends for  $3\frac{1}{2}$  miles through solid granite and is now about one-third complete.



Three shifts were worked and overtime encouraged wherever the men desired to increase their daily pay check

on the work. The dam was completed by January first. The employment of the heading and bench method in tunneling and the use of steam shovels in mucking has facilitated work on the tunnel, which had been extended some 3,000 ft. by the middle of January. Work is now progressing at the average rate of 12 ft. per day on five headings. Gates on the tunnel intake are in place and excavation is partially complete on the power house site. It is expected that the entire work will be completed and in readiness to deliver 40,000 kw. of energy to the San Joaquin system by October 1st of this year. R. C. Starr is construction engineer in charge of the work.



The power house partially excavated. It will be cut out of the solid granite—and only a roof needed for shelter.



## The Art of Conciliation

BY S. M. KENNEDY

(What is the basis of public confidence in the utility company, and how may it be won? The elements which go to make up this indispensable part of public utility service are here analyzed by the general agent of the Southern California Edison Company in the eighth article of his series.—The Editor.)

In America, when an editor rejects your manuscript, he does it either with a curt "Declined with thanks," or else sends a printed slip on which he presents his compliments, which you don't want, and regrets he cannot grant you what you want. But when an editor in a certain oriental country finds that your article or poem or story isn't worth the paper it is written on he sends you a letter like this:

"Illustrious brother of the sun and moon—Behold thy servant prostrate before thy feet. I bow to thee and beg of thy graciousness that I may speak and live. Thy honored manuscript has deigned to cast the light of its countenance upon me. With raptures I have perused it. By the bones of my ancestors, never have I encountered such wit, such pathos, such lofty thought. With fear and trembling I return the writing. Were I to publish the treasure you sent me, the Emperor would order that it should be made the standard, and that none be published except such as equaled it. Knowing literature as I do, and that it would be impossible in ten thousand years to equal what you have done, I send your writing back. Ten thousand times I crave your pardon. Behold my head is at your feet—Do what you will—Your servant's servant—The Editor."

### Winning the Public's Confidence

If nothing better could be said about the foregoing letter, it must be acknowledged that the writer had some conception of the Art of Conciliation. The great trouble with so many Public Utility employees is, they apparently feel that if brusqueness and abruptness will do the work, why bother about trying to please? If some interested organization, seeking the truth, were to send broadcast throughout the land this question, "What is the greatest need of the Public Utility Company of today?" the returning answer would be, "The confidence of its patrons in particular and the public in general." There are many phases of a utility company's business which require more than ordinary attention, and many problems yet to solve, but the ever present problem is how to eliminate the lingering prejudice against such corporations. The responsible heads of companies have little difficulty in obtaining the services of competent engineers to construct and operate a property. There is not such trouble in enlisting the financial aid necessary to develop a property if it is located in a thriving territory with growing population, but there is always a difficulty for even the best intentioned corporation when it comes to the question of winning and holding the confidence and good-will of a community. The question is often asked, "Why does this unfortunate condition continue to exist?" The answer to the query points in two directions—external reasons on the one hand and internal causes on the other. It is a far cry

down the centuries when we look back two thousand years, but before we analyze present conditions it might be profitable to recall some words uttered twenty centuries ago. At that time there lived in Rome a man named Cicero, one of the wisest men whose words and deeds are recorded in the annals of history. He said on one occasion, "It is difficult to tell how much men's minds are conciliated by a kind manner and gentle speech." He must have known that conciliation precedes and induces confidence. If the art existed in Rome in those early days, maybe it can be revived in this country during the present century and applied in such directions as it will do the most good.

### The Origin of Distrust

Looking at the external reasons for distrust of corporations, we find that there is more than one page of earlier corporation history written over with true stories of greed, aggression and disregard of public rights. Turning from the past we find that there is more than one latter day example of short-sightedness, breach of faith and mismanagement; added to this is the ever present yellow journal, with its failing for startling headlines, inveighing against the so-called Trusts. Then there are the mouthings of the professional agitator, and the theories and vagaries of the self-appointed reform politician. We cannot deny that the yellow journal, the agitator and the politician have had some excuse for their utterances, because of the mistakes, indifference and incivility on the part of the management of some utility companies under their observation, and with whom they have had to do business.

Turning to the internal causes of public distrust, it might be well for each company through its officials to make a self-examination. Much regrettable history of corporations, which has left its mark of prejudice on the public mind, is not chargeable to any present day company, but existing companies are responsible for what goes on within their organizations. If the public today does not seem to exhibit complete confidence in all a corporation says and does, perhaps it is not the public that is most to blame.

### Development of Regulation

The regulation of public utilities by State Commissions has advanced step by step during recent years, and it is inevitable that every public



A LITTLE overburdened lamp socket  
is a dangerous thing —  
AN OUTLET FOR EVERY  
APPLIANCE



utility company in the United States will eventually be subject to the immediate control of some Commission responsible to the people. In the main, patrons, consumers, managers, owners and security holders of such properties have been satisfied with the results thus far achieved. Uniform rates have been established, uniform systems of accounting have been put into effect and in some directions uniform methods of operation have been made possible. Some Commissions have very broad powers, and while the distinction between regulation and management is recognized, there is always a possibility that regulation may be extended. If a State Commission has power to dictate what rates shall be charged, what shall be the quality of service and the conditions under which it shall be supplied, then why should it not control the personal treatment which shall be given customers by a public utility through its employees? Are not civility, courtesy and attention as much a part of good service as the rate charged or the voltage delivered? These questions are asked, but such minute supervision is not advocated. However, the trend of the times may bring some surprises in this direction. It would not be an improbable thing for traveling representatives of a Commission to drop into some of the public offices of utility companies, just to learn at first hand how the company treats its patrons across the counters and over the telephones, and through this agency a few company managers might be enlightened about the way their assistants are handling the public. Maybe the trend of the times is pointing to something still more radical. Is it not within the bounds of possibility that some commissions might put a premium upon records of broad public policy and the personal touch in managements, and a penalty may be imposed where a company's reputation in this regard is below a desired standard. Such premiums and penalties might be easily provided when rate fixing investigations are under way. All rates are calculated upon a basis to yield a certain net return on the capital invested. An increase of, say, one per cent above the average allowed would be a handsome premium for some companies, and a decrease of one per cent would, in some cases, be a severe penalty.

#### Incentives to Courtesy

Many officials of companies will say, "Oh, things are altogether different now to what they once were—the public is being well treated." For the present it may be acknowledged that there has been a great improvement in matters of this kind. Managers have sent out correctly worded circular letters with carefully prepared instructions to employees, as to how the public must be treated. If instructions given were always carried out, conditions would be ideal. But they are not. Time and again a man may be instructed to be considerate, civil and polite, but he will not unless he so desires. Unless a man has within him the desire to be conciliatory and courteous, there are only two ways to make him at least observe the forms of civility—namely, through incentive or fear. If he has ambition to progress and knows that he must follow instructions to do so, he

will likely do his best. If he has the fear of losing his position for disobeying he will likely make a brave attempt to do what is wanted. If a company manager wants to really know how his patrons are dealt with, let him send a representative unknown to employees to his different offices to make such inquiries or complaints as are usually made by patrons or the public, and learn how they are treated or answered. Let the representative call up the offices on the telephone asking for information and learn what replies are given or what delays are met with. Some surprises will be in store for the manager who shows this amount of interest in his business. He will learn that he has some clerks who are wonders in diplomacy, and others who handle customers as if they were material to be "eaten up."

#### The Nature of Service

It too frequently happens among corporation employees that the words "serve" and "service" are not rightly understood. The utility company serves the people and consequently the company, its officers and employees are servants. Dignified service is honorable, and in no way degrading, unless the servant himself degrades it. Life is made up of service—all are servants in some respects, although perhaps masters in others. The motto on the coat of arms of the heir to the throne of England is, "I serve." The policeman on his beat, the judge on the bench and the governor in the capitol, all serve; and the President of the United States is the greatest servant of all, because he serves all the people.

If a servant in a house should become incivil, inattentive, indifferent or discourteous to his master, would the master be pleased? Would he love that servant and say that he would be delighted to help him to the utmost? No, not likely! The master would probably say to himself, "I will let that fellow go as soon as I can find someone decent to take his place." The relation between the utility company and the public is very similar. The public is the master and the company is the servant. The company exists by virtue of a franchise granted by the public. The public patronizes the company and from the public the company derives its income. The company is the servant and the public is the master. In the very nature of things, the servant must frequently ask the master for more favors—are they granted cheerfully or reluctantly? That depends upon how the servant has pleased the master. Favors asked by companies often look formidable to those who do not understand; but with communities as with individuals, conciliation may be better than logic—they may often be persuaded when they cannot be convinced.

The public is the people, but whom do the people know as the company? Not the bondholders, stockholders, or directors—not the president, secretary or manager—just the employees who transact the company's business with the public. In all truth a company is known and judged by the men it keeps; at any rate, the public knows of no other way to determine whether a company is good, bad or indifferent—no other way to tell whether a company is worthy



of confidence or entitled to distrust. If the confidence of the public is the greatest need of a public utility company, then the way to supply what is needed is to conciliate—not one department—but all through the organization; not once in a while, but all the time.

### Courtesy Which Convinces

It has now become a habit to lay stress on the word "courtesy" in referring to the relations between a utility company and the public, and it is a good habit. But there are degrees of courtesy—or rather it had better be stated, there is the imitation and the real article. There is the formal courtesy of the lip and manner, and there is the courtesy that flows from the heart. The former freezes and the latter warms—the one is seldom mistaken for the other. In other words, real civility and courtesy must come from within a man and not from without. Stripped of all verbiage, genuine courtesy is the "doing unto others as you would others do unto you." But courtesy is not all that is required to obtain confidence; there must be conciliation. This word expresses a combination of the attributes which compel confidence—namely, consideration, alertness, sympathy, attention and courtesy.

The paramount question is, how to spread the gospel of conciliation among company employes so that they may be permeated with the knowledge of what the word stands for, and its importance to them and the organization of which they are a part. Connected with every up-to-date electric company, there is a New Business Department, and it is a notable fact that the experienced salesmen attached thereto do not require to have the word explained to them. To use a colloquialism, conciliation is the middle name of every successful salesman. They have learned that there can be no success in their work without courteous cheerfulness. They know that conciliation makes friends, and friends make business for the salesman. Now, if the salesman has learned how to spell conciliation, what has kept the cashier, order clerk, and other office employes dealing directly with the public so backward in their lesson? Because the cashier or order clerk is behind a counter in an office, and the customers go to him to do business, is he any better than the salesman who must go out and seek the customer? Is there any reason why an office man should adopt an air of superiority and talk to the customer impatiently, incivily or condescendingly? There is no reason—but even today there are some office clerks so blind that they cannot or will not see the bad light in which they place the company which is paying their salaries, because of lofty indifference and careless discourtesy to the company's patrons.

### Selecting Representatives

The principal points of contact between a company and the public should be guarded by employes who have been carefully selected for the position they have to fill. The manager will find that for the good of his company and its standing with the public, he cannot give too much thought to this important matter. The question of salary should not be allowed to interfere with getting good men for

such work—or of keeping good men at it. Employes of the wrong stamp are dear at any price. Men who are forgetful, moody, grouchy or dyspeptic should be kept in the background and only such men as are cheerful, alert and considerate should be in the forefront in whatever place or through whatever medium the company may transact its business with its consumers and the public.

Some men are born with the natural desire to win friends by conciliation—a few men may have this quality developed in them by education, and others could never acquire it by any possible way. Most electric companies hold regular or occasional meetings of their employes, and it is suggested that at these meetings those responsible for proper public relations should give a series of "little lessons on conciliation." Employes might be called upon to demonstrate how customers should be handled under different conditions. At each meeting one department should show by actual demonstration the ideal way of pleasing the public from its standpoint. In their turn those in charge of office work, collection department, sales department, trouble department, service department, and telephone exchange should show to others in the company how the work can be done in a manner which will please and make friends. The manager should be on hand to criticize, suggest and point out the value of the right way and the injury resulting from following the wrong way. Such a program would impress employes with the absolute necessity of conciliation, and will produce good results, where circular letters of instruction would not avail.

### The Extent of Conciliation

There is an attitude of conciliation which almost every man can assume if he is personally desirous of impressing another to gain a wished-for end. It expresses a desire to please which is clearly visible in the eyes, in the features, in the gestures and in the tone of voice which cannot be misunderstood. This attitude of conciliation is visible not only in personal contact, but may be traced in the wording of letters, and felt in conversations over the telephone. If a man can effectually assume this attitude in personal matters, he surely can also assume it when transacting business for the company which pays for his services. It is the part of the prudent man to conciliate the minds of others and turn them to his own advantage. It is the part of a wise man to conciliate others and turn them to the advantage of the company with which he may be connected and to whom he looks for his future advancement.

Some men think they have done their full duty towards the policy of conciliation if they "meet the customer half way." Some men go a little further and say, "Give the customer the benefit of the



WIRE IN HASTE, rewire at leisure—  
AN OUTLET FOR EVERY  
APPLIANCE



doubt," believing that should be sufficient to please and satisfy. But no! perhaps both classes of men have stopped too soon, for in a complaint or controversy, the real attitude of conciliation assumes that "the customer is always right." Before such an attitude, complaints are forgotten, troubles vanish, and opposition fades away. The attitude of conciliation does not mean a loss of self-respect or the relinquishing of any rights. On the contrary, the implied consideration for the feelings and rights of others adds dignity to a position and costs absolutely nothing.

Representatives of a corporation, in its defense, will sometimes state that it is only an aggregation of individuals, and that the corporation should not be blamed for individual transgressions. What is the public but a greater aggregation of individuals who like their individuality recognized?

The corporation whose employes consistently practice the Art of Conciliation when coming in contact with its patrons will realize some day that, having pleased the individuals, it has finally won the much desired confidence of the public.

## Essentials of Esperanto

BY W. R. DAINGERFIELD

(The common commercial language is now too familiar to the readers of the Journal of Electricity to need any editorial introduction. Following is the next installment of Judge Daingerfield's brief grammar of the language.—The Editor.)

The following words from Paragraphs 23 to 40 are, for beginners, somewhat hard to pronounce:

Escepto, esst-**sep**-to; mallongaj, mahl-**lon**-gigh (the syllable "gigh" rhymes with "guy"); komponitaj, kom-po-**nee**-tigh; konstruitaj, kon-stroo-**ee**-tigh; radiko, rah-**dee**-ko; kiu, **kee**-yoo; unu, **oo**-noo (do not say **yoo**-noo); finiĝoj, fee-**nee**-joy; antaŭ, **ahn**-tow (like how, now, thou); vortoj, **vor**-toy; ankaŭ, **ahn**-kow; uzeblaj, ooze-**eb**-ligh (like lye); ĉirkaŭ, **cheer**-kow; prefiksoj, preh-**feeks**-oy; sufiksoj, soo-**feeks**-oy; primariaj, pree-mah-**ree**-igh; ĉiutaga, tchee-oo-**tah**-gah; vivo, **vee**-vo; grandan, **grahn**-dahn (do not say **granndann**); eŭropaj, eh'-**oo-ro**-pigh (pronounce the **eŭ** as one single syllable; konformigante, kon-form-**ee-jahn**-teh; apostrofo, ah-poss-**tro**-fo; ĝi, jee; Zamenhof, **Zah**-men-of (notice that it is accented on the first syllable, being a personal name); Ekzercaro, Ek-zert-**sah**-ro; leglibron, legg-**lee**-bron (do not say leĝlibron, ledge-**lee**-bron, law-book); Krestomatio, Kress-to-mah-**tee**-o; lingvo, **leen**-gvo; tiu ĉi, **tee**-oo tchee; tricent, **treet**-sent; ĉia, **tchee**-ah; ducent, **doot**-sent; aligante, ah-lee-**gahn**-teh; finiĝon, fee-**nee**-jon; ŝanĝi, **shahn**-jee; vortspeco, vort-**spet**-so; kie ajn, **kee**-ay ine; logiko, lo-**ghee**-ko (do not say lo-**jee**-ko, unconsciously imitating the soft **ĝ** of the English word "logic"); Teodoro, Tay-o-**do**-ro; tajloro, tigh-**lo**-ro; kie, **kee**-ay; parencojn, pah-rent-soyn; uzus, **oo**-zoos (do not say **yoo**-zoos); necerte, net-**sehr**-tey; same, **sah**-mey; jam, yahm; plu, ploo (do not say "plew"); jen, yen; kun, koon; plejofte, play-**off**-teh; manieron, mah-nee-**err**-on; rajdi, ry-dee; oficiala, off-eet-see-**ahl**-ah; adjektivo, ahd-yek-**tee**-vo (do not say "jek"); ricevas, ret-**sehv**-ahs; genitiva, ghen-ee-**tee**-vah (do not say "jen"); scii, **stsee**-ee (this hard word, like others similar to it, becomes easy with the aid of a preceding vowel, thus: mi scias, meest-**see**-ahs, I know); de "scii," dehst-see-ee; iom, **ee**-omm; antaŭjuĝo, ahd-tow-**yoo**-jo (do not forget that we are using **ow** for the sound heard in the English words **how**, **now**, **cow**); individuigi, een-dee-**vee**-doo-**ee**-ghee (the **g** is hard); vinglaso, veen-**glahss**-o; kvanto, kvahn-to (the tendency is to pronounce the **v** like a short **ŭ**, and that is permissible).

La sekvantaj vortoj el Paragrafoj 23 ĝis 40 estas iom malfacile elparoleblaj de komencantoj:

Escepto, esst-**sep**-to; mallongaj, mahl-**lon**-gigh (la silabo "gigh" ritmas kun la angla vorto "guy"); komponitaj, kom-po-**nee**-tigh; konstruitaj, kon-stroo-**ee**-tigh; radiko, rah-**dee**-ko; kiu, **kee**-yoo; unu, **oo**-noo (ne diru junu, **yoo**-noo); finiĝoj, fee-**nee**-joy; antaŭ, **ahn**-tow (kiel how, now, thou); vortoj, **vor**-toy; ankaŭ, **ahn**-kow; uzeblaj, ooze-**eb**-ligh (kiel lye); ĉirkaŭ, **cheer**-kow; prefiksoj, preh-**feeks**-oy; sufiksoj, soo-**feeks**-oy; primariaj, pree-mah-**ree**-igh; ĉiutaga, tchee-oo-**tah**-gah; vivo, **vee**-vo; grandan, **grahn**-dahn (ne diru **granndann**); eŭropaj, eh-**oo-ro**-pigh (elparolu la **eŭ**, kiel unu solan silabon); konformigante, kon-form-**ee-jahn**-teh; apostrofo, ah-poss-**tro**-fo; ĝi, jee; Zahmenhof, **Zah**-men-of (rimarku, ke ĝi estas voĉpremata sur la unua silabo, estante persona nomo; Ekzercaro, Ek-zert-**sah**-ro; leglibron, legg-**lee**-bron (ne diru leĝlibron, ledge-**lee**-bron); Krestomatio, Kress-to-mah-**tee**-o; lingvo, **leen**-gvo; tiu ĉi, **tee**-oo tchee; tricent, **treet**-sent; ĉia, **tchee**-ah; ducent, **doot**-sent; aliigante, ah-lee-**ee-gahn**-teh; finiĝon, fee-**nee**-jon; ŝanĝi, **shahn**-jee; vortspeco, vort-**spet**-so; kie ajn, **kee**-ay ine; logiko, lo-**ghee**-ko (ne diru "logiko," nekonscie imitante la molan **ĝ** de la angla vorto "logic"); Teodoro, Tay-o-**do**-ro; tajloro, tigh-**lo**-ro; kie, **kee**-ay; parencojn, pah-rent-soyn; uzus, **oo**-zoos (ne diru juzus, **yoo**-zoos); necerte, net-**sehr**-tey; same, **sah**-mey; jam, yahm; plu, ploo (ne diru "plju"); jen, yen; kun, koon; plejofte, play-**off**-teh; manieron, mah-nee-**err**-on; rajdi, ry-dee; oficiala, off-eet-see-**ahl**-ah; adjektivo, ahd-yek-**tee**-vo (ne diru "ĝek"); ricevas, reet-**sehv**-ahs; genitiva, ghen-ee-**tee**-vah (ne diru "ĝen"); scii, **stsee**-ee (tiu ĉi malfacila vorto, kiel aliaj similaj, estiĝas facile elparolebla per elparoliĝo kun helpo de vokalo antaŭiranta, jene: mi scias, meest-**see**-ahs; de "scii," dehst-see-ee); iom, **ee**-omm; antaŭjuĝo, ahd-tow-**yoo**-jo (ne forgesu, ke ni uzas **ow** por la sono aŭdata en la anglaj vortoj **how**, **now**, **cow**); individuigi, een-dee-**vee**-doo-**ee**-ghee (la **ĝ** estas malmola); vinglaso, veen-**glahss**-o; kvanto (oni tendencas elparoli la **v** kiel mallongan **ŭ**, kaj tio estas permesebla).





TYPICAL BOILER ROOM FOR EASY CHANGEOVER FROM OIL TO COAL

Many power plant operators prefer to so design the fuel oil operation that quick changeover to coal operation may be accomplished should oil later involve less economic operation than coal. The view shown is that of the boiler room of the steam electric plant for the lighting department of the city of Seattle—Eastlake Avenue and Nelson Place.

## Changing From Coal to Oil

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Fuel Oil as a possible replacement for coal in many instances continues to be a subject of great timely importance throughout the nation. Particularly is this true in New England ports and along the Gulf of Mexico, where easy access may be had by water to the petroleum fields of Mexico. California practice is proving of timely value in assisting engineers of the nation to solve the economic questions involved. Herein the authors show the fundamental calculations to be considered when weighing the respective merits of coal and oil fired steam power plant installation.—The Editor.)

When it is contemplated to change from coal firing to oil firing, the first thing to be considered is the relative cost of the two fuels. This does not mean merely the cost of a ton of coal compared to the cost of a ton of oil, because oil has a far greater heating value than an equal weight of coal. Again, while oil has a fairly uniform heating value, there are great differences in the heating values of different kinds of coal. Consequently in making the comparison it is necessary to know the kind of coal under consideration, and its heating value per pound. Even then we have not gone quite far enough, for the boiler efficiency is not the same for all grades of coal, and is higher for oil than for coal. Thus, with a good grade of semi-bituminous coal an efficiency of 75% is readily obtainable, whereas with a low grade bituminous coal or lignite it is difficult to obtain more than 60% efficiency under ordinary methods of firing. With oil, on the other hand, tests have shown net efficiencies of over 80%, and with careful operation it is readily possible to maintain 78% efficiency in regular plant operation.

Knowing the relative prices and heating values, and the probable boiler efficiency, it is a simple matter to calculate the saving that may be effected by changing from coal to oil. Suppose, for example,

that the owner of a plant is purchasing coal at \$6.00 per ton of 2000 lbs., and that this coal contains 6% moisture and has a heating value of 13,000 B.t.u. per pound dry. He is considering changing over to oil which he can purchase for \$1.50 per barrel of 42 gallons. The oil has a gravity of 16° Be and therefore weighs 336 lbs. per barrel; it contains 1% water and its heating value when free from water is 18,500 B.t.u. per pound.

Since the coal contains 6% moisture it is 94% dry, and 1 ton of coal contains

$$2000 \times .94 \times 13000 = 24,440,000 \text{ B.t.u.}$$

Similarly, 1 barrel of oil contains

$$336 \times .99 \times 18500 = 6,153,840 \text{ B.t.u.}$$

If both fuels could be burned with the same efficiency, then by dividing 24,440,000 by 6,153,840 we would find that one ton of coal is equivalent to almost four barrels of oil. However, if the oil can be



THE COURSE of an appliance attached to a lamp socket never did run smooth —

AN OUTLET FOR EVERY APPLIANCE



burned with an efficiency of 75% and the coal with an efficiency of only 69%, we find that the useful heat in one ton of coal is

$$.69 \times 24,440,000 = 16,863,600 \text{ B.t.u.}$$

and the useful heat in one barrel of oil is

$$.78 \times 6,153,840 = 4,800,000 \text{ B.t.u.}$$

Consequently one ton of coal is equivalent for steaming purposes to

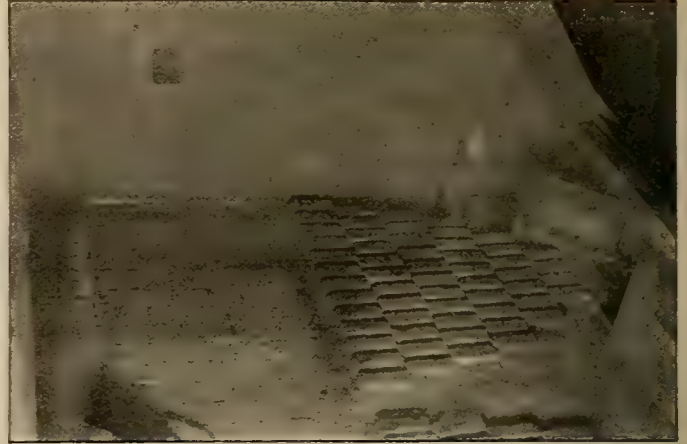
$$\frac{16863600}{4800000} = 3.5 \text{ barrels of oil.}$$

The cost of 3.5 barrels of oil at \$1.50 per barrel is \$5.25, and since the coal costs \$6.00 per ton, the saving would be \$0.75 for each ton of coal. If the plant in question is a 1000-hp. plant, burning say 10,000 tons of coal per year, the saving would amount to \$7,500 per year for the particular conditions assumed.

In the accompanying set of curves a comparison is shown of fuel oil with coal of heating values varying from 10,000 to 15,000 B.t.u. per lb. The heating value of the oil is taken as 18,500 B.t.u. per lb., which is a fair value for California oil, the variation from this value being small. The efficiency of 78% for oil firing assumed in these calculations, can readily be maintained in normal service provided proper attention is paid to the furnace design and the regulation of the fires. In order to make this comparison fairly correct for the different grades of coal, an efficiency of 60% has been assumed for coal having 10,000 B.t.u. and 75% for coal having 15,000 B.t.u. per lb., with intermediate values for coals that lie between these extremes. As the heating value of coal is usually given on the basis of dry coal, and as coal when purchased invariably contains a considerable proportion of moisture, it has been assumed that the coals considered in this comparison contain 6% moisture. In the case of fuel oil the water content does not usually exceed 1%, and this value has been assumed in the comparison. It will be observed from the diagram that oil at \$1.50 per bbl. is equivalent in price to 14,000 B.t.u. coal at \$6.00 per ton.

Oil at \$1.50 per bbl. is also equivalent to 12,000 B.t.u. coal at \$4.60 per short ton.

In addition to the saving in cost of fuel there will always be a saving in labor on changing from



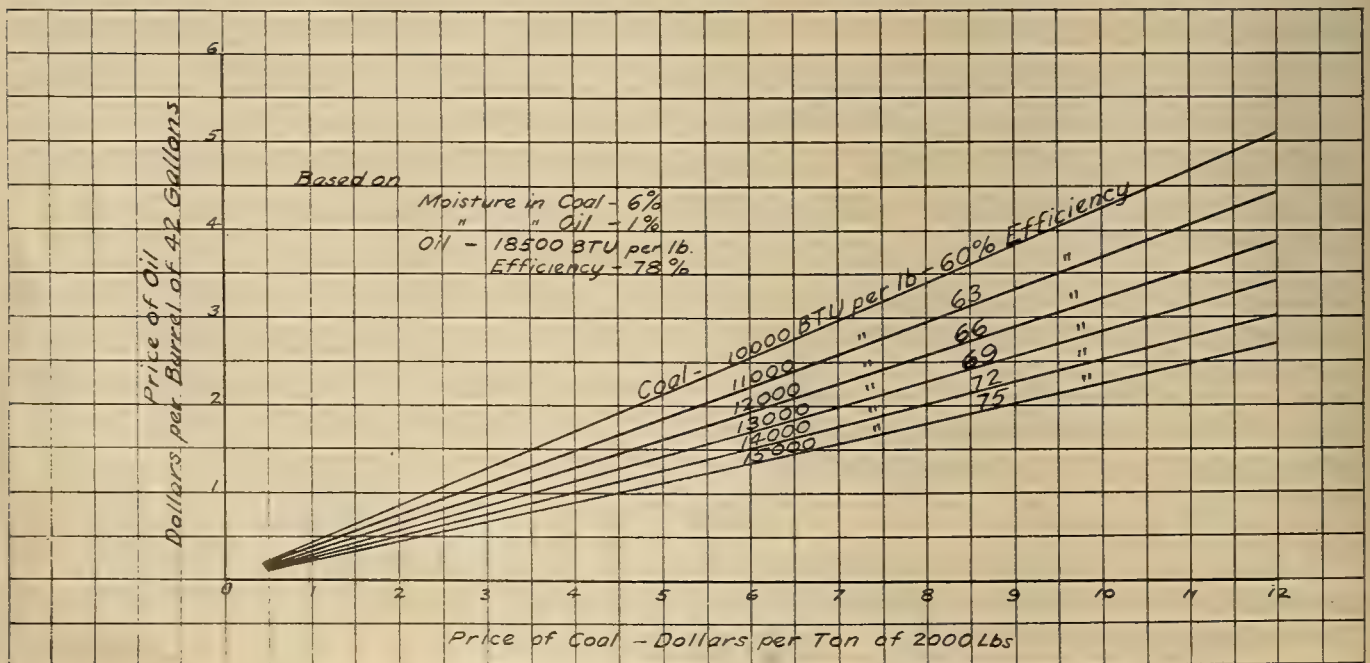
THE FURNACE INTERIOR

Here is shown the furnace interior of an oil-fired boiler similar in design to the specification shown in another illustration on this page. Note the V-shaped arrangement in the brickwork in order to admit air for the economic burning of the fuel oil.

coal to oil, as the operation of firing is much simpler, there are no expensive coal elevators and conveyors to be kept up and there are no ashes to handle. On the other hand, the interest and other fixed charges on the investment required to change over, reduce the saving to some extent. Both of these items, however, are small compared to the cost of fuel, and as they tend to neutralize each other they may safely be neglected, except in special cases.

The apparatus required to change a coal burning plant into an oil burning plant consists of the oil storage tank, oil pumps, oil heater, oil burners with the necessary piping, strainers, regulating valves, etc. In addition an automatic oil firing system may be installed if desired.

The furnaces under the boilers must be altered to suit the new fuel. If the boilers are hand fired this is a simple matter, for all that is necessary is to



COMPARISON OF FUEL OIL WITH COAL OF VARIOUS HEATING VALUES



cover the grates with firebrick, leaving suitable openings for the admission of air, and install the burners properly housed and protected from the heat. A furnace similar to that shown in the illustration may then be used, the grates acting as supports for the checkerwork in the furnace floor. Boilers larger than 300 hp. should have a furnace length not less than 10 feet, so in many cases where the grates are shorter than this it will be necessary to extend them. For the additional length necessary pieces of pipe or I-beams may be used to support the furnace floor, instead of grates.

For stoker fired boilers the design of furnace to be adopted will depend largely on the kind of stoker, and the arrangement of coal furnace and ashpit.



FRONT VIEW OF NEW BOILER INSTALLATION

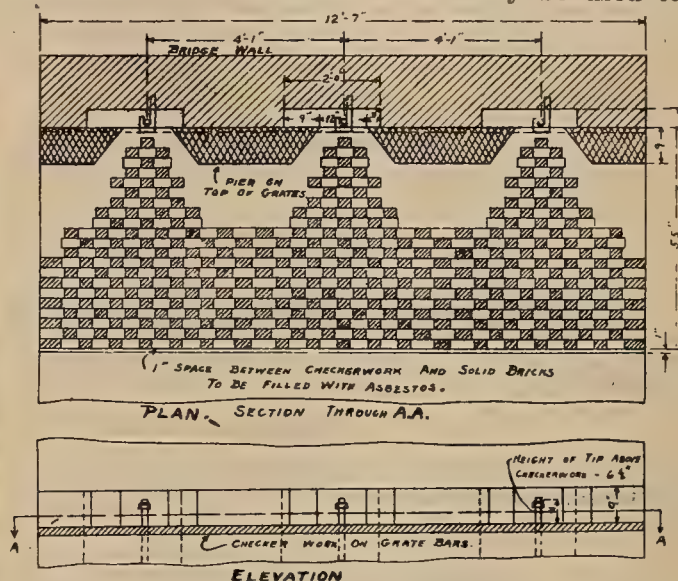
In the view may be seen the pit and foundation setting for oil furnace in new additional installation now under way for Pacific Gas & Electric Company, San Francisco. Note the clean, trim appearance extending to the older fuel oil installation on the extreme left, which is quite characteristic of boiler rooms where oil is used as fuel.

If the use of coal is to be abandoned altogether the stokers should be removed, and an oil furnace installed of the general design indicated in the above view. If the boilers are provided with basement ash pits advantage should be taken of this to increase the furnace volume by placing the furnace floor below the level of the fireroom floor, allowing the air to come up through the ashpit from the basement.

If oil is to be used only temporarily, and it is expected at some future time to go back to coal burning, it will be possible in many cases to leave the stokers in place, placing the oil burner at the rear of the furnace, and protecting the stoker from the heat by means of firebrick supported by structural

material, leaving a dead air space between the stoker and the firebrick. The practicability of this arrangement will depend on the type of stoker, kind of boiler and space available, and each case requires special study to secure the proper design.

The question whether steam atomizing or mechanical atomizing burners should be adopted will depend on local conditions. In general, it may be said that steam atomizers should be used wherever they are applicable, as they have proved their practical value by years of application to stationary work. In special cases where steam atomizers are unsuitable the mechanical burner may be used to



A TYPICAL FURNACE ARRANGEMENT

An excellent furnace arrangement for a 524-hp. boiler with standard low setting is shown above. The checker work on the grate bars indicated in shaded area represents openings  $2\frac{1}{2}$  by 3 in. through brickwork. The free area through the checker work is 2.44 sq. in. per hp., around the burner 0.62 sq. in. per hp., making a total free area of 3.06 sq. in. per hp.

advantage. This would include plants so located that the waste of fresh water is a serious matter. Plants in which it is necessary to force the boilers up to 300 or 400 per cent of their rated capacity may also find the mechanical atomizing burner more suitable, and this will be especially true if a steady load is carried and if the plant is already equipped with forced draft apparatus.

## PUBLIC UTILITY INVESTMENTS

About \$15,000,000,000 capital, representing a considerable part of all the savings of the people of the country, are invested in public utilities, according to a recent statement. The securities representing these savings are held by thousands of investors, large and small, and by nearly every bank and financial institution of the country, and in endowment funds of churches, colleges, schools, hospitals, and in other trust funds.



AN INCONVENIENT OUTLET gathers no current consumption —

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# Mass in Terms of Velocity of Electrons

BY DR. A. C. CREHORE

(Since hydrogen atoms are all alike, the author uses this simple illustration to show how the two expressions for mass of a body are equivalent—the one derived from the conception of weight and the other from the masses of the nuclei of the atoms. In other words, the interesting fact brought out in this discussion is that the mass of a body is proportional to the squares of the velocities of all electrons it contains. This is the seventh discussion this noted author has contributed to the columns of the Journal of Electricity on the subject of The New Physics.—The Editor.)

It is pointed out in this section that there are two equivalent expressions for the mass of a body of gross matter, the one derived from the conception of weight and the other from the masses of the nuclei of the atoms. The force exerted by one body upon another according to Newton's law, the masses being denoted by  $m_1$  and  $m_2$ , is

$$F = k'm_1m_2r^{-2}.$$

Upon substituting the theoretical value for  $k'$  just given this becomes

$$F = \frac{1}{3} \frac{h^2}{e^2m_0} m_1m_2r^{-2}.$$

A third expression for the same force was given above in terms of the speeds of the electrons, as follows:

$$F = \frac{1}{3} e^2m_0 \Sigma_1\beta^2\Sigma_2\beta^2r^{-2}.$$

Equating the last two expressions, the force is eliminated and we find

$$m_1m_2 = \frac{e^4m_0}{h^2} \Sigma_1\beta^2\Sigma_2\beta^2,$$

from which evidently is obtained a general value for the mass of any body of gross matter,

$$m = \frac{e^2m_0}{h} \Sigma\beta^2.$$

In this  $\Sigma\beta^2$  is dimensionless, and  $e^2$  has the same dimensions as  $h$  on the space-time system. Hence, the dimensions of  $m$  are the same as those of the mass of the electron,  $m_0$ , showing that the dimensions are correct. This equation tells us that the mass of a body is proportional to the sum of the squares of the velocities of all the electrons it contains, which is the same thing as the total kinetic energy of motion of all the electrons in the body.

Applying this to find the mass of a quantity of hydrogen gas consisting, say, of  $A$  atoms, it was pointed out above that the sum of beta square for one hydrogen atom is  $hm_H/e^2m_0$ . Multiplying this by  $A$  and substituting in the expression for mass just given, the  $e^2m_0/h$  cancels, and we obtain

$$m = m_H A,$$

which is evidently equal to the total mass of the gas.

Let us next look at mass from the standpoint of the masses of the atomic nuclei. If the charge of the nucleus is  $E$ , the Lorentz mass formula gives the mass of one atom as

$$m = \frac{4}{5} \frac{E^2}{c^2ak},$$

where  $a$  is the radius of the nucleus, and  $m$  its mass. If the number of atoms in the body is  $A$ , many of

the atoms being of different kinds differing in charge and in radius, the total mass of the body  $M$ , may be expressed:

$$M = \Sigma_A m = \frac{4}{5c^2k} \Sigma_A \frac{E^2}{a}.$$

There is good reason to suppose that we should obtain the same value for the mass of the body from this as was obtained by the above method starting with the electrons, although the summation here expressed may be difficult to realize practically in many cases. If the formula is applied to hydrogen, however, the matter is simplified because the atoms are all alike, the charge on each nucleus being  $2e$ , and every radius being the same, namely,

$$a_H = 8/5Kk = 3.2 \frac{e^2}{m_Hc^2k} = 4.8620 \times 10^{-13} \text{ cm.}$$

Substituting these values of  $E = 2e$ , and  $a_H$  in the last expression for  $M$  above, it reduces to

$$M = \Sigma_A m_H = \frac{4}{5c^2k} \Sigma_A \frac{(2e)^2}{a_H} = \frac{4}{5c^2k} \times \frac{4 m_Hc^2k A}{3.2} = m_H A,$$

which is evidently equal to the total mass of the body of  $A$  hydrogen atoms.

We will not attempt at present to consider other atoms than that of hydrogen, that is to say, we will rest content without giving a general proof that the two different expressions for the mass of any gross body of matter are always equivalent.

## ELECTRICAL AIDS TO INDUSTRY

There are but few lines of human endeavor where heat, in one form or another, is not necessary before the product is finished. The wood working establishments, for example, must have heat for the electric glue pots, the leather workers must have heat for their irons and the steel and other machinery factories must have high temperature for tempering, lacquering and japaning.

A recent canvass of the General Electric Company's Schenectady plant showed no less than 1,524 electrically heated appliances in use. A summary of this canvass shows 165 ovens, 216 furnaces for tempering, annealing, etc., 62 high current machines, 87 melting pots, 195 hot plates, 93 glue pots, 9 oil tempering baths, 13 arc type furnaces, 360 soldering irons and small hand devices and 324 small miscellaneous devices. These devices carry a total load of 12,154.5 kw. Of this load 5,341 kw. are connected to ovens and the smaller heating devices and 6,813.5 kw. to the arc type furnaces and high current machines.





A busy morning at the Arizona Gas and Electric Company. On the left the power plant, next to it the ice and cold storage plant, and farther to the right the storehouse and gas plant. In the picture are shown the various automobiles belonging to the company.

## Electrical Service in a Southwestern District

(The demands made upon a power company vary widely according to the character of the district in which it is located. An up-to-date plant in the rapidly growing community described below supplies power for mining, irrigation and refrigeration as well as for all the usual lighting and industrial purposes.—The Editor.)

The town of Nogales, in Arizona, is the center of an extremely rich agricultural, mining and cattle raising district. It has a large import and export business, and is the gateway to the whole surrounding country in Arizona and the wonderfully rich west-coast section of Mexico. In this section agriculture is dependent upon irrigation, which is accomplished by pumping from shallow wells. The supply of water from this source seems unlimited.

Nogales is also the center point of supply for a large and active mining section. The surrounding district is very highly mineralized. A number of old and valuable mines are in operation, and many new developments are being made at this time.

The plant of the Arizona Gas and Electric Company at Nogales has been in operation about three years, and furnishes electric light and power, gas and ice to the town of Nogales, Arizona, the mining district in Patagonia Mountains in Santa Cruz county, the irrigation district of the Santa Cruz river and to the city of Nogales, Sonora, Mexico,—in all a population of over 12,000.

The company has a modern gas plant, manufacturing gas from crude oil by the Lowe process, with a daily capacity of 72,000 feet. The electric power plant and ice plant are housed in a light colored brick building, 168 feet by 58 feet and 40 feet high, with steel and concrete roof and concrete floors making it absolutely fire-proof. The walls between pilasters are almost entirely of ribbed glass set in steel frames, making an exceptionally light operating room.

The power plant consists of McIntosh and Seymour Diesel oil engines, direct connected to General Electric generators, the capacity of each unit being 500 horsepower. These Diesel oil engines burn crude oil of the cheapest grade and the economy is high. The present cost of fuel per kilowatt-hour is approximately five mills. A complete equipment for receiving, storing, pumping and delivering oil from tank cars has been provided. The storage capacity

is about 50,000 gallons. The entire plant represents the latest and best practice in power plant design and construction. The property is located on Grand Avenue, Nogales, Arizona, near the business center and on a railroad siding.

The ice plant consists of a fifty-ton York ammonia compressor driven by a 100-hp. electric motor, and has a daily output of thirty tons of ice. There is an ice storage room for seven hundred tons of ice and a cold storage department of five rooms with 20,000 cubic feet of storage capacity. The company has a tunnel to the railroad siding with electric conveyors and hoists, with double platforms for icing refrigerator cars and for loading ice cars.

The electric distribution system covers the entire town of Nogales and adjacent territory. Its high tension transmission line of 23,000 volts extends over the Patagonia mining district for a distance of about thirty miles. The company has also extended its lines north of Nogales about four miles and entered the irrigation district, where a large demand for power for pumping is expected.

The entire property of the company is practically new and all is of the most modern and efficient type, and no expense is spared to maintain every department at the highest point of efficiency possible.

The towns on both sides of the border are growing rapidly and especially is this true of Nogales, Arizona. The number of customers for gas, electric light and power increases at a rate that taxes the service department to the utmost to keep pace with the demand.



ONE LAMP SOCKET cannot make  
an electrical home —

AN OUTLET FOR EVERY  
APPLIANCE



## An Industrial Division in a Public Library

BY ARTHUR R. BLESSING

(The demand for industrial and scientific books, pamphlets, trade catalogs and periodicals, makes the industrial division one of the most useful departments of the modern public library. Excellent work has been done in establishing and conducting a department of this sort in the Washington Public Library, as described here by the assistant librarian.—The Editor.)

Although Washington is not generally considered an industrial city, an approximation reveals the fact that there are over 500 manufacturing establishments now in operation in the District of Columbia. The needs of these manufacturers and their workmen, the many thousands of professional and scientific men, and the varied business interests demanded an industrial division of the public library.

This demand had been potential for several years, but it was not until 1907 that a separate industrial division could be established to meet the need. In general the plan followed was similar to that of Newark and Providence, where successful industrial divisions were already in operation. The usual amount of newspaper and other publicity was used to announce the opening, and from its inception on the first of November, 1907, the industrial division has proved a complete success.

The most important single group of books consisted originally of engineering sciences in all their various phases, and in both theoretical and applied branches. The aim was to have as complete a representation as possible but not a surplus of any subject not in active demand. Three other important subjects were business and finance, agriculture and domestic science. Pure science was also well represented. Architectural works, drawing, and other fine arts subjects were originally included, but were withdrawn during the war to make way for the flood of material dealing with technical and engineering aspects of the war.

Probably the periodicals constitute the most important part of our collection for current topic use, and of these we have about two hundred, a few of which are kept bound for permanent use on account of their reference value. All books and periodicals used in the industrial division are ordered through our order division and records of their accession, time of arrival and all correspondence concerning them are kept in this division.

As Washington is the center of so many activities, we are constantly in receipt of a multitude of pamphlets, booklets, etc., most of which are of considerable value to us. In exceptional cases, this material is accessioned, cataloged and bound, but the greater part is simply put in manilla envelopes and filed in vertical files. This constitutes what we call our pamphlet collection and is of the utmost value to our readers and ourselves. Subjects are used that correspond in the main to those in our regular catalog and all of our pamphlets are filed alphabetically by subject. These subjects are so subdivided and easily applied to the material in hand that no separate index is needed.

Government documents are used to a considerable extent and as Washington is the home of documents, we are freely supplied. The documents from

the Department of Agriculture and the Bureau of Foreign and Domestic Commerce are especially valuable to us. Foreign trade, which is a very live subject with us, is amply fortified with many excellent government treatises and texts on manners and customs, needs, etc., of nearly all foreign countries. Farmers' bulletins are likewise in heavy demand and these are bound for our permanent collection. Our documents, and in fact all parts of our collection, are subject to constant weeding out so as to eliminate dead wood and keep the resources of the division in a live and healthy state.

The trade catalog collection, which has grown to comprise over 6,000 separate catalogs, is one of our prize assets and its use is enormous. Its field is unlimited and we are constantly adding new ones as well as withdrawing those that are obsolete. This collection is thoroughly indexed and cross indexed. A separate card is made for each subject and thereon are listed all firms whose catalogs we have at the time. A second index is made by firm so that we can tell at a glance whether or not a certain firm is represented. All small catalogs are put into manilla envelopes and are filed right in with large ones of the book type, while the whole scheme is to file alphabetically by subject.

Our rules for lending are very liberal and allow almost unlimited use of all resources for a month if necessary. Not only books are circulated but back numbers of periodicals, pamphlets, trade catalogs and duplicate government documents. At times attempts have been made to circularize various groups of people who should be more fully acquainted with our resources, and these attempts have been successful to a considerable degree. We advertise new books for the industrial division each month by a list in a leading Sunday paper and a reprint of this list in our monthly bulletin.

During the war the use of war books of all descriptions increased a great deal, and in engineering and chemical research work, the industrial division rendered valuable assistance to many officers of both the army and navy. Now that the war is over, men interested in business and trade, particularly foreign trade, are making much use of this division. Not only business men but their clerks and those from the government departments spend much time here using our books on stenography, bookkeeping, accounting, and mathematics.

Our clientele is a little different from the average in that the professional and scientific men are in evidence. This may be accounted for somewhat by the fact that our borrowers number hundreds of students from Washington's many schools and colleges. Engineering of all kinds has always been our strong point, but the business field is fast becoming a close rival for our endeavors.



## SPARKS—Current Facts, Figures and Fancy

(Electrical aids to blushing vie with electrical moth-massacre for popular interest in this group of miscellanea. For the commercially-minded inspiring figures are provided regarding Western business activity, as well as an account of two recent interesting inventions.—The Editor.)

The state of Oregon produced 10 per cent of the platinum used by the United States during the war.

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Diesel oil engines removed from German submarines are being purchased in England for use in electricity works.

\* \* \*

The total contracts for building operations in San Francisco for the year 1919 amounted to \$18,644,343, an increase of \$9,456,135 over 1918.

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There were 12,330 miles of wire added to the telephone exchange plants in New Zealand during the fiscal year ended March 31, 1918, and 13 new exchanges opened with additional accommodation added in 28 others; additional exchange connections for the year amounted to 4,940.

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A recent report records the "progress made in fish rescue work on the upper Mississippi River" and states that up to September 20th "approximately 68,000,000 fish were rescued." No doubt we ought to know what fish-rescue work is, but somehow we find ourselves confusedly wondering whether it is a first-aid or a missionary activity.

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Permanent blushes, acquired by means of electrical tattooing, are now becoming popular among European women, according to a recent report. The outfit comprises an electric tattooing needle operated from a battery and supplied with current through a flexible wire, while a small hollow chamber in the base of the needle contains the coloring matter.

\* \* \*

Moth mangling by electricity sounds like an unnecessarily savage pastime until we learn that it is a method employed by walnut growers to destroy the moth cocoons and larvæ in the walnut sacks. The codling moth has been known to spoil as much as 40% of a walnut crop, and it was necessary to go to large expense in order to pick out the infected nuts. The electric mangling methods, by treating the sack to a pressure of two hundred pounds and a temperature of 700 degrees at the same time effectively destroys the larvæ which are accustomed to spend the winter in the sacks.

\* \* \*

A small hydroelectric plant in the Italian Alps operates under an 8,000-ft. head—the highest head of any hydroelectric plant in the world. Several small plants in Switzerland have heads of over 3,000 ft., and one as large as 3,000 kw. operates under a head of 5,400 ft. Of large plants, the present record is held by a plant in Norway with a 2,400-ft. head,

but this record is to be broken by two plants in the Kings River project of the San Joaquin Light & Power Corporation, which will involve 60,000 kw. each, both to operate under 2,500-ft. heads.

\* \* \*

A recent house-finishing development is a motor-driven stucco machine by which the material is applied by projecting it from the machine by centrifugal force set up by revolving spider blades. The manufacturers of this device state that by applying the stucco in this manner, a skin, or enamel, is formed, making an outside coating which is impervious to moisture.

\* \* \*

An English engineer has recently invented a machine which he claims will bore circular tunnels through the hardest rock, by means of specially constructed hammer tools actuated by "Sonic waves." These waves are able to give the exact force and rapidity to the abraders which is required and which is obtainable by no other means. The abraders will be placed on five rotating arms driven by a Sonic motor. The abrading tools will strike the face of the rock at the rate of 3,000 blows per minute, each blow having a weight of 1,120 lb. By this means the whole face of the rock is abraded by each arm to a depth of  $\frac{3}{8}$  in.; thus with the five arms  $1\frac{7}{8}$  in. will be excavated at each revolution. The Sonic generators are driven by electric motors.

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It will take more than prohibition to put California out of business, judging by the following figures. In 1918, while wine and brandy sold in California amounted to \$16,000,000, the other industries lined up as follows: Petroleum sold for \$127,000,000, or approximately eight times the wine crop. California's hay sold for \$62,000,000, or about four times what the wine brought. The grain crop was sold for \$67,000,000; deciduous fruits (except apples) for \$40,000,000; canned fruits and vegetables for \$71,000,000; dried fruits and raisins for \$41,000,000; citrus fruits for \$47,000,000; beet sugar for \$19,000,000; gold for \$17,000,000; beans for \$35,000,000; potatoes for \$17,000,000; borax, salt, etc., for \$12,000,000; copper for \$12,000,000; nuts for \$12,000,000; cement for \$6,000,000; crushed rock for \$3,000,000; fresh apples for \$7,000,000.



SPARE the wiring expense and spoil the home —

AN OUTLET FOR EVERY APPLIANCE



## PERSONALS

O. B. Coldwell, superintendent of the Portland Railway, Light & Power Company, has been promoted to the position

of the second vice-president of that company. Mr. Coldwell has been known to the electrical industry throughout the West as one of its most earnest and helpful workers. A graduate of Stanford and Cornell Universities, and an engineer of unusual merit, his rise with the Portland Railway, Light & Power Company has been rapid. Mr. Coldwell was one of the first presidents of the Northwestern Electric Light and Power

Association, and has for many years served as chairman of the executive committee of that association, and at the present time he is engaged as chairman of a special committee in the promotion of a special train from the Northwest to attend the convention of the National Electric Light Association at Pasadena, May 18th to 21st, 1920. Strength to his strong right arm!

John Barton Payne, chairman of the Shipping Board, has been appointed by President Wilson to succeed Franklin K. Lane as Secretary of the Interior. This announcement was made the day after the first forms of the Journal of Electricity had gone to press, with the result that in an editorial appearing earlier in this issue, the appointment is discussed as an open subject.

Howard Fearey of the Pacific States Electric Company, Portland, with Mrs. Fearey visited in Seattle recently.

L. Bartlett, engineer for Henry L. Doherty and Company, is among recent Eastern visitors to San Francisco.

J. S. Groo of Portland, Oregon, has become sales manager of the Northwestern Electric Company, succeeding George G. Bowen.

R. C. Chamberlain, Northwest manager Hurley Machine Company, has returned to Seattle from a month's visit to the factory in Chicago.

Professor B. F. Raber, of the mechanical engineering department of the University of California, has been granted a leave of absence.

F. I. Fuller has been appointed first vice-president of the Portland Railway, Light & Power Company, in charge of railway operation.

C. O. Martin, representing the Benjamin Electric Company, Seattle, has returned to that city after spending some time on business in Portland.

D. C. Henny, consulting engineer of Portland, recently passed through San Francisco on his way back from a meeting of the A. S. C. E. in New York.

Howard E. Davis has been appointed as service secretary for the American Association of Engineers, with offices at 407 Hilford Building, Portland, Oregon.

E. A. West, chief engineer and general superintendent of the Denver Tramways Company, has returned to Denver after spending some time in San Francisco.

B. C. Condit, formerly chief engineer of the Northwestern Electric Company, is now with the Great Western Power Company with headquarters in San Francisco.

Miles F. Steele, Pacific Coast manager, Benjamin Electric Manufacturing Company, has recently returned to San Francisco from an extended trip to Southern California.

Willis M. Deming, Pacific Coast general manager for the McGraw-Hill Company, owners of the Journal of Electricity, will return from a visit to the East about February 25th.

F. M. Kerr, vice-president and general manager of The Montana Power Company and chairman of the Steam Railway Electrification Committee of the N. E. L. A. is a California visitor.

A. W. Ransome, from the Boston office of the Blaw-Knox Company, has been appointed Western district manager for the company with headquarters at 754 Monadnock Building, San Francisco.

Pun Ai Do and Chi Chin Yin, leading Chinese merchants, arrived in San Francisco recently from Peking as delegates to the Foreign Trade Convention which will be held in San Francisco in May.

F. D. Weber, electrical engineer for the Oregon Insurance Rating Bureau, has been appointed on the Electrical Hazard Committee of the National Safety Council of Oregon and the Columbia Basin Division.

Charles S. Older and Ralph A. Green, both connected with Mt. Whitney Power & Electric Company for a number of years, have formed a partnership and will engage in the electrical contracting business in Hanford.

Alexander Taylor, for many years manager of works for the Westinghouse Electric & Manufacturing Company, has been made assistant to vice-president in general charge in all plants of production, stocks and stores.

R. V. Orbison, for many years city engineer in Pasadena, has been appointed city manager for the city of South Pasadena. No announcement has been made as to who will succeed Mr. Orbison as city engineer for Pasadena.

J. D. Barnhill of Evans & Barnhill, merchandising-advertising, with headquarters in New York City, is a recent Pacific Coast visitor. Mr. Barnhill is advertising agent for Habirshaw Electric Cable Co., Inc., and other large manufacturers of electrical supplies.

Frank S. Hamilton has been appointed agent for the Mt. Whitney Power & Electric Company at Hanford. Mr. Hamilton has been with the company for fourteen years, having started as a helper in the meter department. For the last two years he has been power salesman in the Tulare district.

R. M. Alvord, local supply manager of the General Electric Company, with headquarters at San Francisco, has

left for eastern cities, where he goes in the interest of the Pacific Coast Section, N. E. L. A. The particular plan Mr. Alvord has in view is the calling upon prominent manufacturers in the East to assist in spreading the helpful message of greater usage of the convenience outlet in the home, in order to make way for more expansive uses of electricity in the home. The entire problem is set forth most completely elsewhere in this issue in the paper by

Garnett Young, which is made to the Commercial Section of the Pacific Coast Section, N. E. L. A. Mr. Alvord has proved himself an able analyzer, and one of the best types of helpful associates in forwarding the good work of the California Electrical Cooperative Campaign, upon the advisory committee of which he serves as a member.







**M. H. Aylesworth**, who has recently been appointed assistant to the president of the National Electric Light Association with headquarters in New York City, comes to his new office with unusual qualifications for utility service. Mr. Aylesworth was for years connected with the Public Service Commission of Colorado as its chairman, and later went to Salt Lake City where he was connected with rate matters for the Utah Power and Light Company. In his present capacity Mr. Aylesworth is executive head of the national headquarters

in the absence of President Ballard. The employment of such splendid talent as Mr. Aylesworth in affairs of the Association has added strength and renewed confidence in its activities throughout the nation.

**Bruce Whitney** of Walla Walla, Wash., has been appointed by the public service commission to supervise the work of taking a census of all public utilities in Washington.

**R. C. W. Libbey** of the Simplex Company has been made Western sales manager of the company, with headquarters with the firm of Holbrook, Merrill & Stetson in San Francisco, who are Western agents for the company.

**William T. Poulterer**, who for a number of years has held the position of engineer with the Philadelphia Electric Company Supply Department, Philadelphia, Pa., has resigned and accepted the position of engineer of the Electrical Development & Machine Company, of Philadelphia.

**E. C. Jones** has resigned his position as chief gas engineer of the Pacific Gas & Electric Company. Mr. Jones was a pioneer in the development of the gas industry on the Pacific Coast, and the retirement of so able a worker from public utility life is much regretted by his many friends and co-workers.

**W. J. Stanton** has accepted a position with The Ohio Brass Company. Mr. Stanton has been identified with the electrical industry for the last twenty years, having started with the General Electric Company and remaining with them for a period of eighteen years in the testing, engineering and sales departments.

**R. W. Shepherd**, former auditor for the Portland Railway, Light & Power Company, has been elected general auditor and assistant treasurer. **A. J. Johnstone** has been promoted from assistant auditor to the position of auditor. **C. M. Huggins**, treasurer, has resigned to accept a position with a lumber company.

**J. G. Miles** has been appointed to the position of supply division manager of the Seattle office of the Westinghouse Electric and Manufacturing Company, succeeding **C. V. Aspinwall** who has been transferred to Spokane. Mr. Miles has for several years been head of the company's insulation section at East Pittsburgh, Pa.

**R. R. Walbridge** has been appointed agent for the Mt. Whitney Power & Electric Company at Porterville, taking the place of **A. I. Whitehead**, who has been transferred to the position of district agent for the Southern California Edison Company at Alhambra. **W. P. Graef**, district agent at Alhambra, has been transferred to a similar position at Long Beach.

**S. J. Lisberger**, engineer of San Francisco district, Pacific Gas & Electric Company, has just returned from a very extended tour of Eastern states after attending a meeting of the apparatus committee of the N. E. L. A. Mr. Lisberger brings back to the Pacific Coast many ideas of the future trend of the development of electrical apparatus.

**Thomas A. Edison**, whose seventy-third birthday was celebrated on February 10th, was recently honored by the electrical men of the Pacific Coast at a joint meeting of the Rotary Club of San Francisco and the San Francisco Electrical Development League, when a telegram of congratulation was sent to the eminent inventor.

**A. L. Rohrer**, electrical superintendent of the Schenectady Works of the General Electric Company, has passed through San Francisco on his way to the Orient. Mr. Rohrer is accompanied by Miss Miriam Rohrer, his daughter, both of whom expect to spend some time in the far east in travel and in recuperation from the shock occasioned by the recent death of Mrs. Rohrer.

**Franklin K. Lane**, Secretary of the Interior, has resigned the post which he has held since the beginning of President Wilson's administration. Prior to that he was chairman of the Interstate Commerce Commission. Announcement has been made that Mr. Lane will be associated in an executive capacity with the Mexican Petroleum Company, the Doherty interests.

**F. M. Feiker**, editorial director of Journal of Electricity, Electrical World, and Electrical Merchandising, has been elected vice-president of the McGraw-Hill Company, and chairman of the Board of Editors of its eleven journals. Men of the electrical industry in the West will hear of this new appointment with unusual interest, for during the past summer, at the time the Journal of Electricity was being taken over by the McGraw-Hill Company, Mr. Feiker spent some time on the Pacific Coast and made many friends. One of Mr. Feiker's methods of getting first-hand information is to go himself into the problem with a thoroughness of detail that is possessed by few men. During his sojourn on the Pacific Coast last summer he went over the new work of the San Joaquin Light & Power Corporation, and the view shows Mr. Feiker with **I. W. Alexander**, of the commercial department, and **R. C. Starr**, chief engineer of construction, preparing to board the tram to be let down into the gorge where the great Kerckhoff Dam is under construction. Mr. Feiker is an electrical engineer of national prominence and his position as head of the editorial staff of the McGraw-Hill Company augurs much for the continued emphasis of electrical development on an international scale throughout the technical press of the nation.



Left to right: F. M. Feiker, I. W. Alexander, R. C. Starr



WHAT IS SCREWED into a lamp socket must be screwed out again —  
AN OUTLET FOR EVERY APPLIANCE



H. T. Cory has been given a leave of absence from the United States Department of the Interior to become chair-



man of a commission of three engineers, one American, one English and one French, to report on the complete utilization of the waters of the Nile River in Egypt for irrigation purposes. This commission is known as the Engineering Commission of the Reclamation Service Department of the Egyptian Government. Mr. Cory sailed for Cairo, Egypt, on January 21, 1920. It will be recalled that Mr. Cory had a large and

substantial part in the reclamation of the Great Salton Sea disaster in Southern California some years back, and engineers in the West will take unusual interest in noting this new and interesting investigation in which he is engaged.

D. S. Kimball, dean of engineering of Cornell University, was the guest of the Engineers' Club of San Francisco on February 5, 1920. During the same week he also spoke at the University of California and at Stanford University. On his Western tour Mr. Kimball has been welcomed from one end of the West to the other, and has appeared before many universities, engineering faculties, and other organizations interested in the welfare of the professional engineer.

Milton Kraemer, a consulting engineer of San Francisco, has left for New York, from which city he expects to leave shortly for European ports. Mr. Kraemer goes abroad at the invitation of certain capitalists in New York City to study combustion problems in Belgium. During his work in San Francisco he has been engaged in the study of combustion problems for the Great Western Power Company and other of our larger central stations of the West. Mr. Kraemer plans to return to San Francisco in about three months.

Frank S. Easton has been appointed Chief Civil Engineer of the Mexican Light & Power Company, Mexican Tramways Company and their various subsidiary corporations in the Republic of Mexico. Mr. Easton was for many years hydraulic engineer for the British Columbia Electric Railway Company, Ltd., having charge of the design and construction of a number of important hydroelectric plants both on Vancouver Island and the mainland. He reports to G. R. G. Conway, Chief Engineer of the Mexican companies, under whom Mr. Easton served when he was Chief Engineer of the British Columbia Electric Railway Company, Ltd.

H. H. Wadsworth, who has been with the corps of engineers, U. S. A., since 1897 and since 1905 chief assistant engineer of the California Debris Commission, has severed his connection with the commission and has opened an office in San Francisco for consulting and general engineering practice, specializing on works for the utilization of water and for flood protection. During the war Mr. Wadsworth held the rank of major. For two and one-half years he was connected with the advisory board of engineers appointed by the President to advise the Secretary of the Interior on San Francisco's plans for developing a source of water supply.

H. N. Sessions, of the Southern California Edison Company, chairman of the membership committee of the Pacific Coast Section, N. E. L. A., advises that his committee has already secured three hundred new members and has just started. He modestly ascribes a large part of the credit for this showing to E. G. Snow of the Pacific States Electric Company at Los Angeles, and R. I. Carruthers of the Mt. Whitney Power & Electric Company at Visalia. As ninety per cent of these new members have been secured from Southern California, Mr. Sessions estimates that the North

will have to get busy if they are not to be outclassed by the South.

Max Thelen, formerly president of the California Railroad Commission, has been appointed on the Liquidation Board which is to handle the return of the railroads to private ownership. Mr. Thelen is recognized, from his constructive work on the California Commission, as well as his recent work in the national field, as one of the foremost authorities on public utility policy in the country.

W. D. Moore, in charge of maintenance and construction work for the Pacific Telephone and Telegraph Company at Portland, will go to Seattle as head of the plant department. H. J. Tinkham of Spokane will be transferred to Portland to take his place. C. B. Allsop, recently transferred from San Francisco to Portland, will remain in charge of traffic operations in Oregon under the title of division superintendent of traffic.

William S. Turner, consulting civil and electrical engineer of Portland, Oregon, has recently returned from an extended trip throughout the East. His work in the East included valuation reports on various Pacific Coast properties, an effort to interest New York capital in developing a large hydroelectric power proposition in which he is interested, and a study of the electric railroad situation, especially as regards rates, franchises and motor bus competition.

#### OBITUARY

A. C. Hansen, city engineer of Los Angeles, died February 9th from influenza.

David S. Collins of the Celite Products Company, in New York, died on January 15th.

#### N. E. L. A. NOTES

##### Manufacturers Appointed on Committee —

The National Electric Light Association has for the first time gone outside the electric light and power field for members of one of its major committees. The executive committee of the association has confirmed the president's appointment of Guy E. Tripp, chairman of the board, Westinghouse Electric & Manufacturing Company, and O. D. Young, vice-president, General Electric Company, as members of the public policy committee.

John A. Britton, chairman of the public policy committee, said, "There is a relationship in the industry that makes manufacturers as essential to the success of the organization as operators." Mr. Britton urged the acceptance of these appointments because of the good it will do the entire industry.

##### New Headquarters Organization —

In order to strengthen Association activities by making individuals responsible for certain work, the executive committee of the National Electric Light Association, on recommendation of the president, has resolved to departmentalize the work at headquarters and to reorganize executive control through the executive committee in such a way as to give all parts of the country representation in direct proportion to the volume of business done.

M. H. Aylesworth, whose title has been changed from executive assistant to the president, to executive manager of the association, has prepared a full report on this subject which is now being studied by a committee appointed for the purpose. Such a plan will involve certain expenditures, and so this committee, and Treasurer H. C. Abell, in conjunction with the finance committee, is studying plans for financing the activities. The new plan will not be effective until July 1, subject to the approval of the Pasadena convention in May.

Under the plan it is proposed first to add a department of engineering and one to handle publicity, to the three existing departments of committee service, company service, and finance and accounting.



## Meeting Notices for Electrical Men

(A feature of electrical activities during the past week was the phenomenally large gathering of the San Francisco Electrical Development League and the Rotary Club. The Northwest district also reports interesting meetings both of engineers and contractor-dealer associations.—The Editor.)

### Joint Meeting of San Francisco Electrical Development League and the Rotary Club

The joint luncheon meeting of the San Francisco Electrical Development League and the Rotary Club of San Francisco, held in the ball room of the Palace Hotel on February 10th, was an occasion of great importance to the electrical industry. "Do It Electrically" was the illuminated legend displayed at the speakers' table, and the whole trend of the day's program was to show the great facts of electrical enterprise in the West. The exposition of modern power development presented by Robert Sibley, editor of the Journal of Electricity and Western editor of Electrical World and Electrical Merchandising, was listened to with great attention by the 500 business men present, and the result of the enthusiasm inspired among them thereby is bound to be profitable to the entire industry.

Thomas Doane, president of the Rotary Club, in calling the meeting to order, heartily welcomed the members of the Development League as representatives of a truly vital factor in modern life. The usual good fellowship of the Rotarians was displayed in the announcements and the introductions of guests. Secretary E. H. Feighner read telegrams from Rotarians W. M. Deming and R. M. Alvord, now in the East, congratulating the organization on its observance of Electrical Day.

D. E. Harris, vice-president and sales manager of the Pacific States Electric Company, was introduced as chairman of the day. He inaugurated proceedings by inducing all who were members of both Rotary Club and Electrical Development League to arise, then penalizing them for their prominence by levying fines with a heavy hand. Paul M. Downing and H. F. Jackson, new vice-presidents of the Pacific Gas & Electric Company, were introduced and promptly fined. A telegram of congratulation was sent by the gathering to Thomas A. Edison, in observance of his seventy-third birthday.

Pointing out the importance of a knowledge of the electrical industry to all business men, Mr. Harris presented Robert Sibley, the speaker of the day. Editor Sibley gave a comprehensive survey of the accomplishments of the West in electrical development, supplementing his remarks with illustrations and graphic charts thrown upon the screen. The many "world records" held by the West in electrical engineering were emphasized. Typical of these features was the table showing the fact that the "power pool" formed during the war by the power administrator of California constituted the greatest combined system in the country:

Pacific Gas & Electric Company	
Great Western Power Company	
Sierra & San Francisco Power Company	1,500,408,765
Commonwealth Edison Company	1,488,080,000
Niagara Falls Power Company	1,188,221,770
Ontario Power Co. & United Electric Light & Power Co.	954,913,584
Montana Power Company	947,732,014
Montreal Light, Heat & Power Company	946,832,817
Hydraulic Power Company	871,563,138
Toronto Power Company	800,638,000
Southern California Edison Company	794,687,405

Information little known to the average businessman—such as the fact, for instance, that the West, with 8 per cent of the country's population, utilizes 20 per cent of the electrical energy generated in the nation—was presented in a forceful manner, accentuating the importance of electrical development to the community as a whole.

The enthusiastic applause of the audience when Mr. Sibley had concluded his address indicated the intense interest which had been aroused in these representative men of San Francisco by presentation of the achievements of the electrical industry in the West.

### San Francisco Electrical Development League

"California Electrical Cooperative Campaign Day" at the League was held on Monday, January 26th, and consisted of a most complete review of the activities of the Campaign and its plans for the future. Lee H. Newbert, chairman of the Advisory Committee of the Electrical Cooperative Campaign, acted as chairman of the day, and in the course of his remarks presented the viewpoint of the power companies on the results of the movement. D. E. Harris spoke on "The Jobbers' Viewpoint," while

R. M. Alvord gave the attitude of the manufacturers, and C. L. Chamblin that of the contractor-dealers. H. W. Angus, secretary of the California Electrical Cooperative Campaign, presented an advance summary of the Advisory Committee's yearly report. Particular attention was drawn to the co-operative advertising sections and pages, a display of the best examples being made. A number of prominent advertising men of San Francisco were present as guests.

On February 2nd, the members of the Electrical Development League were inspired by a talk on "Americanization,"

### BUILDERS OF THE WEST — LXXI



W. D'A. RYAN

The brilliant and enduring effects of the illumination at the Panama-Pacific International Exposition in 1915 brought out a certain beauty, transformation and efficiency that have established new records in the art of illumination. Since that period, these same principles made use of in San Francisco in 1915, have been utilized in the lighting of three of our great western cities, Los Angeles, San Francisco and Salt Lake City. To W. D'A. Ryan, illuminating engineer of the General Electric Company, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his genius, displayed in so advancing the art of illumination that the West today is looked to as the model after which the other great districts of the world should pattern.



WHILE THERE IS LIGHT there is no room for electric appliances on the lamp socket —

AN OUTLET FOR EVERY APPLIANCE



by John J. Arnold, supervisor of the International Business Department, Bank of Italy. G. I. Kinney, of the International General Electric Company, acted as chairman of the day. At this meeting, amendments to the constitution were unanimously carried lengthening the term of officers of the League to one year. These amendments were printed in the Journal of Electricity of February 1st.

#### Oregon Association of Electrical Contractors and Dealers

The regular meeting of the first district, Oregon Association of Electrical Contractors and Dealers, was held Monday, January 26, 1920, at the Chamber of Commerce. The meeting was called to order by Chairman Bauman at 7:30. The following firms were represented:

F. A. Bauman Electric Co.	Scott Electric Co.
J. F. Barrett	Jaggar-Sroufe Co.
R. W. Larsen	Morrison Electric Co.
Pierce-Tomlinson Co.	Vanderlip & Lord

Mr. Pierce, chairman of the Code Committee, reported progress in the revision of the Code. Mr. Sroufe's motion that a committee be appointed to appear before the city council to urge the adoption of the National Underwriters' Code, with the addition of the necessary administrative clauses, was not favorably considered.

Mr. Barrett, chairman of the Retail Section, suggested a series of lectures on illumination to be held during meetings devoted to the retail section. On motion of Mr. Tobey, the suggestion of Mr. Barrett, with amendment offered by Mr. Tomlinson to the effect that foremen and salespeople from the different firms be invited to attend, was approved, and Mr. Barrett authorized to proceed with the arrangements.

At the regular meeting February 2nd, the following firms were represented:

J. F. Barrett	E. L. Knight & Co.
F. A. Bauman	NePage-McKenny Co.
Jaggar-Sroufe Co.	Pierce-Tomlinson Co.
E. L. Knight & Co.	Portland Elec. Maintenance Co.
R. W. Larsen	Scott Electric Co.
Morrison Electric Co.	Smith-McCoy Electric Co.
Western Electric Works	Vanderlip & Lord
	G. R. Cooley, of Seattle

Mr. Kenny reported for the special committee on the proposed electric show, that there had been no meeting of the committee on account of his illness.

A motion was carried that the next meeting be devoted to a special order of business to discuss important points in the new Code and the advisability of having the National Underwriters' Code written into the city ordinance, with the addition of the necessary administrative clauses.

Mr. Sroufe of Jaggar-Sroufe Company, in a very able and interesting way, discussed the Electrical Contractor in his relation to the Electrical Industry as a whole.

Mr. Cooley, of Seattle, was called on and reviewed the contracting situation in his city for the past few years, and dwelt on the absolute necessity of open-minded discussion of problems as they arise and of fair dealing between members of the electrical industry and the public.

#### Synchronous Club of Los Angeles

The new year opened auspiciously for the Synchronous Club of Los Angeles on the evening of January 15th, when the regular monthly meeting was held. The auditorium in the Edison Building was well filled on this occasion. Mr. F. A. Short, representative of the State Industrial Accident Commission for the Southern District, gave an interesting and instructive talk on the new safety rules. After the meeting the members adjourned to the Edison lunch room where refreshments were served.

#### Civil Engineers of Southern California

The regular monthly meeting of the Southern California Association of members of the American Society of Civil Engineers was held at the Jonathan Club in Los Angeles on the evening of February 11th.

Following an excellent dinner, Mr. Roy V. Reppy delivered an address on "Political and Legal Aspects of Flood

Control." This address was part of the symposium on flood control which this organization has been conducting for the past year.

Mr. Reppy was followed by W. H. Code, who spoke on "Financial and Executive Organization of the California Conservancy Act."

#### Northwest Power Association

The Public Policy Committee for Oregon, of the Northwest Power Association, met in Portland on Jan. 29th, 1920, and considered the proposed rules of the Public Service Commission of Oregon covering service extensions. It was the sense of the committee that this method of filing rules of general application is not feasible, as the question of the financial and operating practice of the utilities is not considered; but the Commission might well require the individual companies to file an extension tariff in conformity to their own peculiar conditions of financing. A hearing could then be held and the Commission could determine the reasonableness of same, based upon each company's experience.

Also the committee asked the Commission to defer the enforcement of the Modified Accounting Classification, effective Jan 31, 1920, in regard to Property Accounts, and asked for a hearing on same.

#### Meeting of Engineering Societies

The members of the various engineering societies of Portland, Oregon, were addressed by Dr. Dexter Kimball, dean of engineering at Cornell University, at the University Club, Thursday evening, Jan. 29, 1920. The meeting was under the auspices of the American Society of Mechanical Engineers. Mr. Kimball's address was on "The Engineer's Broader Field of Activities." He said in part:

"The engineer will be called upon in the near future to solve the question relating to the proper and just distribution of wealth, as he is the one who knows the industries—the politician does not—as this country is primarily an industrial country. The engineer has been only concerned in the production of wealth and has always shunned the problem of the just and proper distribution of same. In other words, the engineer has gotten this country into an 'industrial mess,' and he is the logical one to straighten it out. Our country has solved the production of food and wealth, and to have the government endure, where other forms have failed, it must solve the problem of justly distributing that wealth among everyone according to their labors in producing it."

The forming of an Engineering Council in Oregon was discussed but no action taken.

#### Seattle Section, A. I. E. E.

The Seattle Section of the American Institute of Electrical Engineers met at the Arctic Club assembly room on January 20th with sixty members and ten visitors present. Chairman G. E. Quinan presided. An executive committee of three members was appointed consisting of Harisburger, Magnusson and Ross. The papers and meetings committee will consist of C. F. Terrell, chairman, E. S. Code, Mr. Lund, F. D. Nims, and another member not yet selected. Mr. Lindsay reported on the meeting of the council of the Associated Engineering Societies at the Engineers' Club on Friday evening, January 16th. Activity of the council for this year was discussed at the meeting and an outline of the proposed program was read by Mr. Lindsay. General discussion followed and on motion the matter was referred to the executive committee for report at the February or March meeting. The chairman expressed the desire that a large representation from the Section be at the Pacific Coast convention to be held at Portland July 21-23. A letter was read from C. S. Van Dyke, chairman Schenectady section, suggesting suitable commemoration of the one hundredth anniversary of important electrical discoveries. On motion the Section voted that the centennial be commemorated in the manner proposed. Professor William Spraragen presented a paper on "Electric Welding of Mild Steel," with particular reference to ship-building. During the war the speaker was connected with the National Research Council as assistant chairman of the Welding Research Committee. Recent developments in electric welding were described, of which a large amount had



been performed for the shipping board. Presentation of the paper was followed by discussion in which various members participated.

#### Jobbers' Annual Meeting

The Annual Meeting of the Pacific Division of the Electrical Supply Jobbers' Association is scheduled for Feb. 26th, 27th and 28th at the Hotel Del Monte. The secretary has sent out the following concise message:

"If you are coming, specify number of persons and reservations required. If you are not coming, do not tell me about it. If you are sick, come and take a little white golf pill and drink of the waters of Del Monte and get cured. If you are too busy, come and learn how to handle too much business with profit to yourself. If you are not busy, come and learn how to get busy. Come first and tell your troubles afterwards to the Secretariat of the League of Nations."

#### The Ten Foot Candle Club

The Sunbeam lighting specialists with the Western Electric Company, located in the various houses throughout the country, have organized the Ten Foot Candle Club to cooperate with the various associations, such as the Illuminating Engineering Society, in the campaign to promote the use of higher intensities in the illumination of factories and mills. The club has adopted as its slogan—"Devoted to the Promotion of Adequate Illumination Properly Diffused and Without Glare." There are no dues, and no officers except T. J. Rider, Jr., of the Chicago Sunbeam office. Mr. Rider founded the club, and signs himself "Lumen." The club has its own stationery, with the Foot-Candle Meter forming the most conspicuous part of the design, and containing a list of charter members.

#### Electrical Golf Club

Members of the electrical fraternity in Los Angeles have organized an informal golf club which conducts a game every Thursday afternoon at the San Gabriel Club links. "Jim" Pomeroy is president of the organization and F. H. Murray is secretary. The membership includes manufacturers, jobbers, dealers, contractors and central station men. Any follower of Mr. Kilowatt is welcome to come out and join the game, according to Mr. Pomeroy.

Each Thursday a small cocktail cup (a representative of the Journal repeated this question and is quite sure that is what Pomeroy said) is given to the man who turns in the best score. Later a large cup will be given to the member collecting the most small ones. February fifth the honors went to M. B. Austin of Chicago, who turned in a card of 73 net with a 24 handicap.

#### WESTERN MEETINGS

Feb. 10. A. I. E. E. and N. E. L. A., Portland sections—E. L. Kavanaugh—The Electric Furnace for Brass Melting.

Feb. 10. Synchronous Club of Los Angeles—Capt. J. H. Pengilly—Illuminating and Eliminating the Hun Bomber.

Feb. 12. Engineers' Club of San Francisco—E. R. Jackson—Fighting For Liberty Under President Lincoln and President Wilson.

## HAPPENINGS IN THE INDUSTRY

#### PLAN OF WIRING COMMITTEE, COMMERCIAL SECTION, N. E. L. A.

The Wiring Committee in planning to investigate portable cords for heaters is arranging for some laboratory tests, but it understands and believes that the laboratory tests, or at least the first ones that will be made, will not give the practical or commercial values of the cords. In fact, what it is really aimed to do is to test the tests by comparing the results of the first tests with commercial experience, and then by devising and arranging for other tests, finally to get a form of tests which shall as nearly as practicable conform to commercial and practical experience.

For this purpose, the Wiring Committee hopes to get the managers of some of the appliance departments of central stations to give the results of their experience.

The Wiring Committee will prepare sheets in which the various cords to be tested will be described according to their trade name and specifications.

The gentlemen will then be asked to rate the different cords, as No. 1, No. 2, etc.

The average of the ratings of a number of different appliance department managers will be computed with the thought that such averages will give the best information at present available as to the commercial value of the different cords.

The following gentlemen have volunteered to rate the cords, but in addition the Wiring Committee would like to have a number of others, and if any central station man who is familiar with the cords on the market will volunteer to do this the Wiring Committee will be very much obliged. If he will send his name to Mr. R. S. Hale, chairman, 39 Boylston street, Boston, Mass., the list of cords, trade-marks, etc., will be sent.

Boston—C. E. Greenwood  
Baltimore—Dorsey Smith  
Chicago—A. G. DeClercq

St. Louis—C. Michel  
New York—Mr. Lewis  
Philadelphia—H. Calvert

It will not be necessary for the gentlemen to rate each and every cord, but of course if there is a cord which they do not rate, because they have never seen or examined it, that will be omitted and the appropriate adjustments will be made in calculating the averages from their report.

#### ENGINEERS FAVOR HOOVER

The following resolution, favoring the "Hoover for President" movement, has been passed by the Joint Council of the Engineering Societies of San Francisco:

Whereas, There is at this time a strong and widespread sentiment for Mr. Herbert C. Hoover for President of the United States as an independent candidate, free from political deals and pre-election pledges; and

Whereas, Mr. Hoover, by his work in Europe, has shown executive and administrative abilities of the highest order, particularly fitting him for handling both the economic problems of reconstruction at home, and our relations with other nations; and

Whereas, The Joint Council of Engineers of San Francisco has a patriotic duty to perform at this time, not only as representing engineers, but also as a representative body of American citizens; be it therefore

Resolved, That the Joint Council of Engineers of San Francisco, representing 2,000 engineers in the Bay district, endorses Mr. Herbert C. Hoover for President and invites the engineering bodies of the United States to join with it in forming an organization to further Mr. Hoover's election, and in such other activities as will insure the affairs of the nation being handled on an efficiency and non-partisan basis; and be it further

Resolved, That copies of this resolution be sent to all engineering organizations and technical journals throughout the United States, and that such other steps be taken as will further the movement of "Hoover for President."

#### PUBLIC UTILITY RATE HEARING

The application of the Mount Whitney Power and Electric Company for an increase in rates, brought some important figures before the California Railroad Commission



YOU CAN LEAD an electric appliance to a lamp socket, but you cannot make the customer use it —

AN OUTLET FOR EVERY APPLIANCE



recently. At the hearing H. A. Barre, electrical and mechanical engineer of the Southern California Edison Company, of which the Mount Whitney Power and Electric Company is a subsidiary, stated that rates now in force, including a 15% surcharge allowed some time ago, total a revenue of only \$1,588,000 in the year 1920, while the total revenue required to meet all necessary expenses will be \$1,764,050. In 1919 the company's revenue totaled \$1,360,584.

The company has submitted a rate schedule involving an average increase of 11% over present charges.

#### ELECTRICAL PRODUCTS COMPANY IN NEW HOME

Having outgrown their present quarters, the Electrical Products Corporation of Los Angeles have moved to their recently completed factory building at 1128-1134 West Sixteenth street. This company, which makes a variety of electric signs, moved three years ago to the factory which is now being abandoned. At that time Paul D. Howse said, "These new quarters will accommodate us for years to come."

The new factory is three times the size of the former one and again Mr. Howse, president of the company, is saying that his concern will not have to move for many years. The new factory and its equipment are modern in every respect and second to none in the country. The new factory, which was built and is owned by Electrical Products Corporation, will also be manufacturing headquarters for the Tucker Electric Sign System.

#### LOS ANGELES GAS AND ELECTRIC CORPORATION BANQUET

Two hundred and forty members of the Los Angeles Gas and Electric Corporation organization have been in the employ of the company for over ten years. They are called the "Old Guard" and each year have a banquet. This annual affair was held at the Alexandria Hotel on the evening of February 4th.

Mr. O. L. Moore, auditor for the company, acted as chairman and many entertainment features were put on by the members. These included a minstrel show and music by the company band.

#### THE WATER POWER BILL

The purpose of the water-power bill introduced in the House of Representatives and which was referred to the Committee on Water Power is: "To create a Federal Power Commission and to define its powers and duties; to provide for the improvement of navigation, for the development of water power, for the use of the lands of the United States in relation thereto, and for other purposes. The entire Act has 29 sections. Significant extracts are as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, that a commission is hereby created and established, to be known as the Federal Power Commission (hereinafter referred to as the Commission), which shall be composed of the Secretary of War, the Secretary of the Interior and the Secretary of Agriculture. \* \* \*

"Sec. 4. That the Commission is hereby authorized and empowered—  
 "(a) To make investigations and to collect and record data concerning the power industry and its relation to other industries and to interstate or foreign commerce, and concerning the location, capacity, development costs, and relation to markets of power sites, and whether the power from navigation dams can be advantageously used by the United States for its public purposes, and what is a fair value of such power, to the extent it may be necessary or useful for the purpose of this act. \* \* \*

"(d) To issue licenses to citizens of the United States, or to any association of such citizens, or any state hereof, or to any state or municipality for the purpose of constructing, operating and maintaining dams, water conduits, reservoirs, power houses, transmission lines, or other project work necessary or convenient for the development, transmission and utilization of power. \* \* \*

"(h) To perform any and all acts, to make such rules and regulations and to issue such orders not inconsistent with this act as may be necessary and proper of carrying out the provisions of this act."

#### LEGISLATION AFFECTING UTILITIES

The Governor of Oregon has signed three bills which affect utilities in that state. One increases the compensation to workmen 30%, another increases the bond limit for roads from 2 to 4% based upon the assessed valuation, and a third provides for making up the deficit of the Public Service Commission for the fiscal year.

Six bills, affecting utilities and engineers, were vetoed. One of these concerned amendment to the professional engineers' registration laws. The other five involved salary increases for the State Engineer, Highway Engineer, Sealer of Weights and Measures, safety inspectors in the Bureau of Labor, and for several county engineers.

#### PUBLIC UTILITY FINANCES IN CALIFORNIA

Electric railways of California in 1918 reported net operating revenues of \$8,257,428.37 as compared with \$8,240,703.01 in 1917. The net revenues of the United Railroads of San Francisco increased from \$743,675.14 in 1917 to \$2,462,446.08 in 1918. The increase is due to more favorable operating conditions, the company having no strikes and less jitney competition in 1918.

The water companies of the State, according to the Railroad Commission figures, reported net operating revenues of \$4,009,765.96 as against \$4,099,931.73 in 1917, a decrease of \$90,165.79.

The net revenues of the electric companies reported for 1918 showed a total of \$16,969,638.87. In 1917 the total was \$16,123,663.47.

Water, gas and electric, telephone and telegraph companies, and steam and electric railways, filing annual reports with the Commission, collected in 1918, in the form of rates, the sum of \$576,154,003.08, an increase of \$59,490,213.91 over the \$516,663,789 collected in 1917. The operating expenses of the same utilities during 1918 are reported at \$420,242,463.28, an increase of \$81,650,518.51 over 1917. There was a decrease in the net operating revenues of the same utilities for 1918, the reports showing \$155,911,539.80 for 1918 as against \$178,071,844 in 1917, the difference being \$22,160,304.20.

#### DESTROYED PLANT BEING REBUILT

The Remmert Manufacturing Company's electric washing machine factory at Belleville, Illinois, was destroyed by fire on the 27th of January. Due to a freight embargo some seven hundred finished machines were on hand waiting shipment. There was also a stock of all materials, except some motors, necessary to make one thousand machines. The entire stock of finished machines, parts, raw materials as well as factory building and machinery, were entirely destroyed. The cause of the fire is not known. It started in the oil house and spread so rapidly that it was only possible to save the office records and a sample of the new 1920 model machine which would have been put into production in February.

The work of rebuilding the factory was started almost immediately after the fire. New dies and jigs are being made in a rented machine shop and the company hopes to start building washing machines again by March 1. The physical loss was about covered by insurance.

#### NEW NORTHWESTERN POWER PLANT

The Lebanon Electric Light & Water Company, of Lebanon, Oregon, is making preparations for the erection of a new plant on the north side of the canal and the west side of Main street. Work has commenced on a temporary flume to carry the water around the new plant. Two new water wheels, new electric generators and new pumping equipment will be added. The plant will have double the capacity of the present works.

#### IMPROVEMENT IN POWER LINE

The Wise power line of the Pacific Gas & Electric Company is being extended 5.2 miles to Newark substation and will be operated at 110,000 volts when completed. In the near future a second circuit will be added to the Wise line from Drum power house to Newark substation via Halsey and Wise power houses, a total distance of 161.5 miles. Both of these improvements will afford greatly increased transmission capacity from hydroelectric plants in Placer, Nevada and Yuba counties to the south bay district.



## THE BUREAU OF STANDARDS

## A Letter to the Editor

(The Bureau of Standards is often misquoted as to its activities and its fields of investigations now engaging its experts. Here is a letter from the chief physicist of the Bureau that should prove helpful in clearing up some of these misunderstandings.—The Editor.)

The Bureau is now working under an appropriation for its public utility work for the fiscal year ending June 30th, 1920, stated as follows: "For the investigation of the standards of practice and methods of measurements of public utilities, such as gas, electric light, electric power, water, telephone, and electric railway service, and the solution of problems which arise in connection with standards in such service \* \* \*."

This has nothing to do with the study of rates, valuation or capitalization, which I understand you to mean by public utility ethics, and the Bureau has no plans whatever for such studies.

Our Circular 32, "Standards for Gas Service," and 56, "Standards for Electric Service," do cover very fully and completely such subjects as meter errors, methods of testing and maintaining meters, gas pressure variations, voltage variations, interruptions in service, impurities in gas furnished, and certain questions of public relations often included in service standards, and include complete summaries of all public service commission regulations now in force in each state.

Circular 32 is now being revised for its fourth edition and only two weeks ago a conference was held here at the Bureau with a committee of the American Gas Association and other interests, including the state commissions, to whom the whole manuscript of the revised circular was submitted for criticism and comment. The committee agreed unanimously on nearly every question brought up for discussion. Circular 56 is also being revised, and as soon as the material is in shape, it will be submitted to all interested parties for criticism before it is published. This is the established practice of the Bureau, and we feel that few publications are issued anywhere that have received such careful consideration and widespread opportunity for criticism.

I want again to call your attention to my full discussion of the Bureau's methods in my paper published in the Journal on July 15, 1919, and hope you may be able to make it clear to your readers that the Bureau in no wise interferes in any manner whatsoever with the work of public utility commissions. On the contrary, the Bureau's work has been cordially welcomed by the commissions and by utility operators, when its scope and purpose are understood. I should be glad to know whether you personally approve of the very thorough cooperation with the Bureau of the state commissions and the industries, and whether you think there is any ground for complaint against the Bureau. Are you familiar with the Bureau's work and publications?

Respectfully,

E. B. ROSA,  
Chief Physicist.

## TRADE NOTES

## Increase of Capital and Capacity —

The Lapp Insulator Company of Le Roy, New York, is erecting an additional factory and installing a considerable amount of new machinery in order to increase its capacity 50% within the next five months. Its capital is also being increased from \$150,000 to \$500,000 to take care of rapidly increasing business.

## New Electrical Contracts —

The National Electric Company are installing the electrical work in the new building of the Francis Motor Car Company, Portland, Oregon.

The West Coast Engineering Company are installing the electrical equipment in the new mill of the West Oregon Lumber Company at Linton, Oregon.

E. L. Knight and Company have the electrical contract for the new garage at 775 Washington street, Portland, Oregon.

The Blue Bird Electric Shop of Tacoma won the contract for the electric fixtures for the new \$300,000 apartment house being built at Eleventh and Prospect streets, Seattle, Wash. This was won in open competition with the leading fixture houses of the Pacific Coast. The cheapest rent for apartments will be \$225 per month and upwards, on a two-year lease.

## Election of Officers —

The regular annual election of officers and directors for the Los Angeles Gas and Electric Corporation was held on January 28. There were no changes made in the present organization, consisting of: W. B. Cline, president; Wm. Baurhyte, C. S. Vance and C. A. Luckenbach, vice-presidents; T. P. McCrea, secretary; Horace Cline, treasurer; W. E. Houghton, Comptroller, and A. B. Day, general manager.

## New Contract —

The NePage-McKenny Company have the contract for the electrical installation in the new building of the Honeyman Hardware Company, 9th and Glisan streets, Portland, Oregon.

## New Offices —

In addition to the district sales offices recently announced by The Booth Electric Furnace Company, a Detroit office has been opened in charge of M. A. Beltaire, Jr., at 805 Hammond Building, as well as an office at Birmingham, Alabama, in charge of Gassman and Cunningham, Brown and Marx Building.

Announcement is also made of the sale of a two-ton Booth two-phase steel melting furnace to the Cincinnati Steel Castings Company, Cincinnati, Ohio.

## Election of Officers —

At the meeting of the Board of Directors of Rathbone, Sard & Company, held Jan. 28, 1920, the following officers were elected: Russell E. Sard, president; John D. Green, vice-president; Arthur M. Blanchard, vice-president and secretary; Sidney H. Kent, treasurer; William E. Palmer, assistant secretary.

H. H. Daley, who recently assumed his duties as sales representative of the Majestic Electrical Development Company, has been making a trip through the Pacific Northwest and the intermountain territory. Mr. Daley was at one time a salesman with the Pacific States Electric Company, and has been for many years well and favorably known in the West as electrical salesman with various concerns. He brings to his new work the results of extensive practical experience, together with the good wishes of a host of friends.



GOOD THINGS always come in threes, provide a socket for each one —

AN OUTLET FOR EVERY APPLIANCE



## LATEST IN EVERYTHING ELECTRICAL

(The final addition to the electric laundry, to make it complete, is now forthcoming in the shape of an electric clothes drier. Among other devices reviewed here are a handy electric water heater and an improved searchlight for automobiles.—The Editor.)

### AN ELECTRIC CLOTHES DRIER

An electric clothes drier, invented and manufactured by R. M. Miller of Oakland, and handled by the Domestic Electric Appliance Company, 1533 Clay St., was built for use in the home and of the same capacity as the average electric clothes washer. It operates on the centrifugal principle, the



Another addition to the electric laundry—a clothes drier which will dry for ironing in from 12 to 15 minutes.

outer diameter of the basket which contains the clothes traveling at 7000 ft. per minute, throwing the water out, which in turn is replaced by air drawn in from the center and forced through the clothes. It will dry for ironing in from 12 to 15 minutes with no danger of injury to the finest piece of goods, no broken buttons, no clothes line or clothes pins.

The machine occupies a space of 24 inches by 30 inches and stands 26 inches high, weighing approximately 200 pounds. It is operated by a  $\frac{1}{4}$ -hp. electric motor (cost approximately 2 cents per hour) through a governor clutch mounted on the driven shaft, and is automatic in its action of pick-up the load, the load also governing the clutch. This clutch makes it possible to start the load with a motor just big enough for running the load, or nearly so.

This machine makes it possible to have a complete home laundry, as washing and ironing machines have been on the market some time.

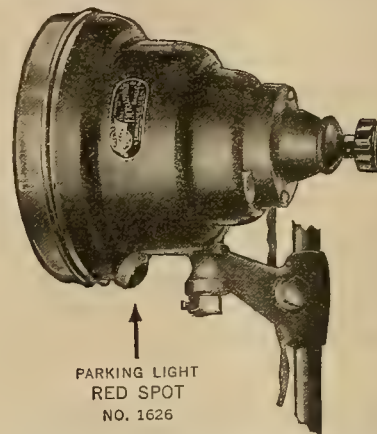
### IMPROVED AUTOMOBILE SEARCHLIGHT

An improved model of the "Red Spot" searchlight for automobiles is offered by the F. W. Wakefield Brass Company of Vermilion, Ohio. The unique feature of this model is a small deflector and lens in the housing of the lamp which throws a red beam to the rear, thus making it a practical one-bulb "parking light."

Motorists will quickly appreciate the economy and desirability of this device. Cars parked at night at the curb or roadside must be lighted front and rear to comply with the law, and for protection against collision. This commonly requires that sidelights and tail light be left burning sometimes for several hours at a time—a very serious drain upon the batteries, especially in winter when starting takes more than the normal amount of energy.

The manufacturer of the "Red Spot" points out that not only does his invention provide adequate and legal front and rear lighting from a single lamp, but that this light is

placed in the position on the car which will insure the greatest protection, since the searchlight is invariably mounted at the extreme left side and well outside the wind shield frame so that passing vehicles will naturally give the parked car plenty of clearance.



An automobile searchlight which serves several purposes

The parking light feature makes the "Red Spot" searchlight a triple duty accessory. In normal service it is a keen and penetrating searchlight with easily adjustable focus and wide range. In emergency and by a single touch of the finger it becomes a red danger signal. Now, with the rearward deflector and lens, it becomes also an economical and safe parking lamp.



The Hotvent electric water heater. In residences, if the proper size of heater is used, covering for tank or piping is unnecessary.

### AN ELECTRIC WATER HEATER

A convenient and efficient electric water heater is being advertised by the Aetna Electric Appliance Company of Boston, Mass. The 2500-watt heater is barely 8 inches long by 5 inches in diameter and weighs only 13 lbs. It has nearly 100 square inches of heating surface. It is economical and durable, and is made in all sizes to fit any tank. One of the recent uses to which it has been put is to keep the water at boiling point on steam fire engines, so that it will take but a very few minutes to get a working head of steam.



## Book and Bulletins

### The Outlook for Research and Invention

By Nevil Monroe Hopkins, M.Sc., Ph.D.; 241 pp.; size 7 $\frac{3}{4}$  by 5 $\frac{1}{4}$  in. Published by D. Van Nostrand Company, New York, and on sale at the Technical Book Shop, Rialto Building, San Francisco. Price \$2.00.

The avowed object of this interesting and attractive book is to stimulate a more general interest in the broader aspects of American research, to point out the educational requirements which best develop the inventive faculty, and to indicate the directions which will steer clear of inefficient duplication of effort. The volume includes among other things a review of American war research, photographs of some famous inventors, with brief accounts of their development, and a chapter on the making and protecting of inventions. A valuable appendix is added in the form of a list of practical problems awaiting solution.

### Radio Engineering Principles

By Henri Lauer, B.S., and Harry L. Brown, B.E.E. 300 pp.; size 6 $\frac{1}{4}$  by 9 $\frac{1}{4}$  in. Published by the McGraw-Hill Book Company, Inc., New York, and on sale at the Technical Book Shop, Rialto Building, San Francisco. Price \$3.50.

As a general text book on radio covering the many new developments in the field made during the war, this volume fills a very definite need. It is devoted mainly to a study of the characteristics and use of the three-electrode vacuum tube in radio-telegraphy and radio-telephony, but the principles involved in the older radio apparatus are treated in sufficient detail to inform the student on all essential principles of wireless communication.

The volume is well arranged and well printed. It contains twelve plates and a large number of line drawings which are an invaluable addition to the text.

### The Business Library—What It Is and What It Does

By Louise B. Krause. 117 pp.; 5 by 7 in. Published by the Technical Publishing Company, and on sale at the Technical Book Shop, Rialto Building, San Francisco. Price \$1.50.

This compact little volume, just off the press, is a unique publication dealing with a subject which has only recently leaped into prominence. The material is a composite study of many business libraries, based on long experience and resolved into a practical analysis of every detail of the business library, its particular service to the organization, and the most efficient method of handling it. The volume is fully illustrated throughout, and each chapter concludes with a list of references for additional reading on the particular subject treated. It serves not only to indicate the immense possibilities of the well-conducted business library, but is an authoritative practical guide for the librarian and the business man in the handling of this increasingly important department of an up-to-date business house.

### Industrial Calendar

An interesting and attractive calendar was sent out recently by the Youngstown Sheet and Tube Company of Youngstown, Ohio. It contains twelve duotone views, 8 by 15 inches, made from photographs in the Youngstown Company's works, and is useful and informative as well as an attractive piece of publicity. The company is willing to mail it to anyone interested, on the receipt of six cents to cover postage.

### A New House Organ

The Benjamin Electric Manufacturing Company's new house organ, "The Benjamin Reflector," is a sturdy newcomer who promises to make a name for himself if subsequent issues live up to the standard set by the first. In eight pages this initial issue comprises a number of brief articles, and smaller items of general interest, as well as much of the

friendly, personal material which contributes so much to a company's sense of unity. We wish the Benjamin Reflector the best of luck.

### Cutler-Hammer Publication

The Cutler-Hammer Manufacturing Company of Milwaukee have revised and reprinted two of their standard descriptive booklets known as Booklet "A" and Booklet "S."

Booklet "A" describes C-H Motor-Operated Brakes for alternating current service, made for application similar to the direct current Type M magnet brake, such as for cranes, elevators, mine hoists and other kinds of conveying and hoisting machinery. A recent interesting application was made on a large plate planer to prevent over travel of the tool and consequent damage to the machine in case of failure of power or other emergency, necessitating a quick stop.

Booklet "S" illustrates and describes the C-H Magnetic Separator which is used in 35 different industries. The three principal uses may be classified as follows:

1. Cobbing, or removal of stray iron that would injure crushing, grinding or cutting machinery.
2. Recovery of iron for its intrinsic value, as found in refuse sands from foundries, garbage, etc.
3. The purification of products.

Cement plants use magnetic separators in two places; one to prevent the entrance of iron or steel into the crushers and pulverizers used in crushing the rock and the other to prevent magnetic material from entering the coal pulverizer. The latter use is especially recommended since it has been shown that a spark caused by iron or steel getting into the pulverizer may cause a violent explosion of a mixture of air and coal dust emitted from the pulverizer.

More pertinent information, new engineering data, new installation views and the explanation of new uses were the primary reasons for re-editing these two booklets.

### Lighting Fixtures

With the publication of its new catalog No. 120, the F. W. Wakefield Brass Company of Vermilion, Ohio, announces several new lines of lighting fixtures so arranged and standardized as particularly to appeal to dealers and contractors serving the great middle-class demand. The lines are several named, Homeric, Heroic, Heraldic and Hendrick, and consist of assortments to meet every standard need. In addition, the catalog lists the Wakefield commercial units designed for use with Ivanhoe, Phoenix and other glass in combination with high-powered lamps.

### Farm Lighting and Power Equipment

The Delta-Star Electric Company, Chicago, Illinois, have issued Bulletin 35 detailing plans for serving farmers from high tension lines. It contains considerable data on various forms of contracts for taking on this service at a profit to central stations, and is illustrated with a large number of photographs and line drawings.

### Switches

A very complete catalog has recently been issued by the Trumbull Electric Manufacturing Company of Plainville, Conn. It consists of some 160 pages fully illustrated, and has a heavy dark green paper cover with the Trumbull trade mark, the "Circle T" in bright red on the front. It is bound in a unique manner—by means of three heavy fasteners—enabling one or any number of the heavy glazed pages to be removed without injuring the catalog.



FAINT HEART ne'er won fair wiring contract —

AN OUTLET FOR EVERY APPLIANCE



## NEW ELECTRICAL DEVELOPMENT

(Continued progress is reported on the large power projects in the Northwest, while extensive financial developments are under way in the Pacific Central district. Ornamental street lighting and a number of irrigation projects are features of Southwestern news, and numerous hydroelectric undertakings and line extensions are reported from the Intermountain region. —The Editor.)

### THE PACIFIC NORTHWEST

**TACOMA, WASH.**—The R. R. Lang Company, electrical contractors and engineers, have opened offices here at 109 South Ninth Street.

**VANCOUVER, B. C.**—The Shipton Electric Pig Iron and Steel Smelting Company, Ltd., has been incorporated here for \$250,000.

**KIRKLAND, WASH.**—The Occidental Rubber Company of this city will build a new plant in which an electric drive is to be installed.

**LEAVENWORTH, WASH.**—It is reported that the Tumwater Light and Power Company of this city is planning to build a modern plant.

**WENATCHEE, WASH.**—It is reported that a large electric power plant will be erected at the mouth of Chelan River and that the Great Northern Railway is backing the project.

**SALEM, ORE.**—The development of power near Early, Oregon, is contemplated in an application filed with the state engineer's office by Homer S. Wall of Wasco, covering the appropriation of 300 second feet of water from the John Day river.

**EVERETT, WASH.**—Architect A. H. Albertson, 725 Henry Building, Seattle, has prepared plans for a one-story banking building for the Securities National Bank of this city, which will cost about \$75,000. An indirect lighting system will be installed.

**SEATTLE, WASH.**—Sub-letting of part of the Cedar Lake power unit steel pipe contract to the Western Pipe & Steel Company of San Francisco by Willamette Iron & Steel Works, Portland, has been approved by the finance committee of the city council.

**WENATCHEE, WASH.**—The Wenatchee Valleg Gas and Electric Company is erecting a concrete building to house its steam generator station, with a capacity of one thousand hp., which is to be in operation by April first. The total cost is estimated at \$80,000.

**SEATTLE, WASH.**—The city council has adopted an ordinance appropriating \$200,000 to finance construction of the street railway extension on East Marginal Way. The installation of a double-track line will probably begin at Carleton avenue and East Marginal Way and extend on East Marginal Way to First Avenue.

**SEATTLE, WASH.**—An appraisal is being made of the Seattle & Rainier Valley Company's lines and equipment by the city of Seattle in order to determine the price which the city should pay for the property should it be desired to take over the only privately owned line in the city. The property was offered to Seattle recently for \$1,656,000.

**YAKIMA, WASH.**—Electric Power & Appliance Company has been incorporated for \$25,000, by Albert L. Schroeder, C. H. Kirby and Arthur L. Fullbright. The company will maintain a farm lighting plant department and will handle all lines of electrical accessories and appliances manufactured by the Western Electric Company.

**WALLA WALLA, WASH.**—It has been decided by the city water commission to extend the pipe line to a new diversion dam to be built in the Wenaha forest reserve. Next a pipe line will be built from the reservoir site to the city, and a third reinforced concrete reservoir will be built, not to exceed 24,000,000 gallons capacity, with the balance of the funds.

**SEATTLE, WASH.**—Sealed proposals will be received by the board of public works, up to

March fifth, for the construction of twenty-two miles of railroad from Rockport to the site of the proposed Skagit River power plant. The estimated cost of this project is \$450,000. According to C. F. Uhden, chief engineer for the Skagit project, work on an extensive scale on the plant will not begin for at least eight months or until the railroad has been constructed. At present a sawmill is being constructed and camp site made ready, preparatory to blasting rock for the roadway.

**WALLA WALLA, WASH.**—Applications have been filed with the state hydraulic engineer by W. F. Crowe and others for diverting some of the water of the Touchet river at Bolles and carrying it by canal to lower Eureka flat land. The project would take in about 72,000 acres in the Prescott and flat sections. It is proposed to build a canal 12 feet wide and eight feet deep to carry the water. The proposed ditch has been surveyed. The cost of the improvement is estimated at \$2,000,000 and will be financed by the formation of irrigation districts and issuance of bonds, the sale of which has already been assured to eastern capitalists.

**PORT ANGELES, WASH.**—By approving the assignment of the sublease of Ediz Hook spit lands from George F. Whalen to the Washington Pulp & Paper Corporation of Virginia, the city council cleared the way for that corporation to commence work on its \$2,500,000 paper plant. The plant as planned will have a capacity of about 60 tons a day. Zellerbach Paper Company of San Francisco is heavily interested. Power will be supplied both from the Olympic power plant on the Elwha river and from a specially constructed steam plant at the pulp and paper mill. Chris Kuppler & Sons of this place and Seattle, contractors, are making arrangements for materials and labor for construction of the first four buildings to house the plant.

**SEATTLE, WASH.**—The city utilities committee considers the recommendation of Superintendent of Lighting, J. D. Ross, for the sale of \$1,005,000 of light extension bonds, already authorized and agrees to the issuance and sale of \$1,000,000 more bonds for light and power extensions. When \$750,000 of an issue of \$1,755,000 for light and power extensions was authorized, an estimate was furnished of the extensions proposed, including \$195,000 for reconstruction of the penstock between Cedar Falls dam and Cedar Falls power plant. The new request is for \$570,000 more for this particular improvement and as a result of a conference, a committee of three was appointed to consult with Superintendent Ross in an attempt to pare down the estimates to the \$1,005,000 of bonds authorized and yet unsold.

**SALEM, ORE.**—E. G. Hopson, engineer, 205 Central Building, Portland, filed application with State Engineer Percy A. Cupper to take 1,400 second feet of water from the Metolius River in Crook county for commercial light and power purposes. It is the intention to construct a cyclopean concrete dam 50 feet high and 500 feet long at the top. The headgate and semi-circular canal will also be of concrete. Turbines will be connected with electric generators and a fall of 140 feet is expected to develop 18,000 theoretical horsepower. The cost is estimated at \$1,300,000. It is anticipated that work will start as soon as pending federal legislation,

permitting the utilization of power on public lands is enacted. Hopson also makes application to take \$1,200 second feet of water from the Metolius river in Crook county for commercial light and power. This dam is to be 20 feet high and 650 feet long at the top. It is to be of rockfill and concrete with headgate and circular canal of the same material. Turbines connected with electric generators will develop 43,000 horsepower, using a fall of 360 feet. The cost of this project is to be \$1,500,000. Work will begin as soon as the legislation above referred to is enacted.

### THE PACIFIC CENTRAL DISTRICT

**DAVIS, CAL.**—A resolution has been adopted setting forth the sale of \$75,000 of city bonds for the erection of a municipal water system.

**TRACY, CAL.**—The board of directors of the Naglee Burk irrigation association has let to J. E. Johnston the contract for lining with cement and shaping 180,000 square feet of ditches in the district.

**MARYSVILLE, CAL.**—The Yuba County Board of Supervisors will appropriate \$1000 for preliminary surveys of the proposed Yuba-Nevada-Sutter Irrigation District advocated by the Yuba-Nevada-Sutter Water and Power Association.

**SAN FRANCISCO, CAL.**—A third hearing before the Irrigation Board of the Miller & Lux corporation for permission to create an irrigation district of 113,000 acres in Kern and Tulare counties, riparian to Kern river, was postponed until May 3.

**OAKLAND, CAL.**—The Western Power Company is building a power line from the American Manganese plant to the Parr Terminal property, for the purpose of supplying light and power for the new wharves and warehouses which are being constructed by R. W. Littlefield.

**SAN FRANCISCO, CAL.**—The Board of Public Works asked the Supervisors to make available from the water construction fund \$12,341 to cover the cost and delivery of 24-inch riveted steel air pipe for the Hetch Hetchy project. The contract was awarded the Montague Pipe and Steel Company.

**SACRAMENTO, CAL.**—Application for permission to divert 20,000 cubic feet a second of water from the Tuolumne river for power and irrigation purposes has been made by the Modesto irrigation district. It is proposed to build dams, power-houses and a distributing system at a cost of \$16,000,000.

**STOCKTON, CAL.**—Western States Gas & Electric Company recently began service in the town of Valley Spring, located about thirty miles east of here, on the company's 60,000-volt transmission line. Practically every house and business establishment in the town has been connected. The company also supplies the street lighting.

**WESTWOOD, CAL.**—The Red River Lumber Company plans to establish a construction camp on Clear Creek, near here, and to build a dam across Feather river. The dam is to be a part of a hydroelectric power development scheme by which the company plans to develop 5,000 horsepower of electric energy for use in driving the machinery in the company's sawmills here. The plan to use electricity is prompted by a present fuel shortage.



**EMERYVILLE, CAL.**—A. H. McLaren, electrical engineer, is laying out additional equipment for the American Rubber Company, whose factory is located on Park Avenue. The American Rubber Company's business has increased so rapidly the last few years that it is necessary for this firm to double their manufacturing capacity.

**ALAMEDA, CAL.**—Superintendent Jos. Kahn reports that the demand for electricity on his side of the estuary, for power purposes, has increased very materially within the last twelve months. The Associated Oil Company is about to erect a large station at the Webster street bridge, on the Alameda side, where they will install upwards of 150 horsepower in electrical motors.

**STOCKTON, CAL.**—Sherman A. Jubb, engineer, filed with the city council plans for Stockton's new harbor in connection with the deep-water-to-the-sea project. The commissioners are said to favor the plan unanimously. The specifications call for widening the head of the channel from its present width of 250 feet to 1,200 feet, and increasing the water frontage nearly seven times.

**MARTINEZ, CAL.**—Articles of incorporation for the West Coast Dredging Company, a concern organized by five Antioch men, were filed with County Clerk J. H. Wells here. The firm is incorporated for 50 years with a capital stock of \$50,000, divided into 500 shares. It is organized for work on deepening waterways, excavation operations, and buying and selling of dredging material.

**PORTERVILLE, CAL.**—Geo. B. Sturgeon, who has been retained as the chief engineer for the storage water and distribution system for the Success Valley, arrived here from San Francisco and will put a party in the field. Mr. Sturgeon estimates the engineering work and preparation of plans will occupy about 90 days. Construction of the dam will be the largest single item of the work. This dam will be about 400 feet wide on top, 200 feet long on the bottom and forty-five feet in height.

**SALINAS, CAL.**—As the result of the drive for funds to purchase a site and construct a building for the proposed dehydrating plant to be installed here by Messrs. Lewis and King of Atascadero, a new company, to be called the Salinas Valley Improvement Company, has been formed here. It is composed of local capitalists and farmers. The concern has a capital stock of \$50,000, of which amount \$30,000 has been actually subscribed.

**SACRAMENTO, CAL.**—The Woodward Way Manufacturing Company proposes to sell 510 shares to certain persons in exchange for 11 applications for letters patent, and 490 shares to secure funds for the construction of a new building and to acquire tools, machinery, materials, merchandise and working capital. The company proposes to own, operate and conduct a general repair shop and sheet metal and electrical construction work, and principally to manufacture and sell certain automobile devices for which applications for letters patent are pending in the United States Patent Office.

**COLUSA, CAL.**—To obtain funds with which to increase its water and power supply the Snow Mountain Water and Power Company has applied to the Railroad Commission for authority to issue 15,000 shares of its preferred capital stock. The proceeds of the stock sale are to be used principally to construct a dam at a point in Lake county known as the Gravelly Dam Site. According to the application of the company other changes in the system have been planned with the general result that the power available will almost be trebled. It is estimated that the cost of the dam and improvements will not exceed \$1,500,000.

**OAKDALE, CAL.**—That Melones appears to be an ideal dam site for irrigation purposes is the opinion of State Engineer W. F. McClure, who has just completed a preliminary inspection

of the site where the Oakdale irrigation district is planning to build a reservoir. The State Engineer told local land owners who objected that a dam at that point would be more expensive than to work through the cooperation of the power companies; that the State Bond Commission would give preference to the views of directors, as representing the people. The two power companies have expressed a willingness to cooperate with the irrigation districts and either build the dams and sell water for irrigation, or to permit the districts to build and buy water from them for power purposes.

**OAKLAND, CAL.**—Several hundred thousands dollars are to be spent by the directorate of the San Francisco-Sacramento Railway, formerly the Oakland, Antioch and Eastern Railway, for improvements during the coming year, according to the expenditure budget just adopted. The work contemplates the construction of a branch line between Slyde and the plant of the Pacific Coast Shipbuilding Company, the purchase of additional motor equipment and rolling stock, and extensive improvements on the roadbed, maintenance and general equipment. In addition to six new passenger coaches to handle intercity traffic, new transforming substations will be installed, catenary construction employed on trolley overhead between Saranap Junction and Bay Point; the tunnel between Shepherd and Redwood Canyons constructed at a cost of \$150,000, and the entire roadbed rebalasted at a cost of \$10,000. Work has already started on the Clyde extension.

### THE PACIFIC SOUTHWEST

**LONG BEACH, CAL.**—Electrification of the Southern Pacific line on Broadway between Elm and Cerritos avenues and discontinuance of the remainder of the Broadway line is under consideration.

**LOS ANGELES, CAL.**—Application has been made to the State Water Commission by the Sespe Light & Power Company of Los Angeles for permission to appropriate 60,000 acre feet per annum from Piru Creek in Ventura county, for power purposes.

**LOS ANGELES, CAL.**—Bids on additional \$500,000 of Los Angeles Flood Control Bonds were received February 11. This sale will bring the total amount issued up to \$3,326,625. The total amount authorized is \$4,450,000. The bonds will pay 5% interest.

**CALEXICO, CAL.**—Preparations are under way for meeting the drainage problem in the Imperial Valley. The Imperial irrigation district in conjunction with the mutual water companies and local drainage districts, will be formed and the condition remedied.

**RIVERSIDE, CAL.**—The Southern Sierras Power Company has made application to the State Water Commission for 45 cubic feet of water per section from Convict Creek, Mono county, for power purposes. The total amount of power to be developed is estimated at 14,077 T.H.P.

**SAN PEDRO, CAL.**—The Pacific Electric Railway Company has applied to the Railroad Commission for authority to abandon a sand-pit spur crossing Gaffey street on the Gardena-San Pedro line. It is proposed to re-locate the track to meet the requirements of a project opening up a main boulevard into San Pedro immediately west of the San Pedro line.

**LOS ANGELES, CAL.**—The city engineer, city attorney and city electrician have been instructed by the city council to prepare and present an ordinance providing for the installation and maintenance of an ornamental lighting system in Seventh street, San Pedro, between Beacon street and Pacific avenue. The city will pay a portion of the maintenance costs.

**FORT SUMNER, ARIZ.**—The new dam and canal irrigating about 8,000 acres of fruit and land on the Pecos river at Fort Sumner, can be completed for less than \$200,000, as reported

by M. C. Hinderlider, an irrigation engineer of Denver. \$100,000 must be spent on construction of a new concrete dam, and the balance on an intake tunnel which will be built connecting the dam with the present gravity canal, which will be widened and deepened.

**LOS ANGELES, CAL.**—An application for authority to issue 50,000 shares of its common capital stock has been filed with the Railroad Commission by the Southern California Edison Company. The proceeds of the sale are to be used in making extensions and improvements to the company's system, subject to the approval of the Railroad Commission. According to the company's application the value of its operative property, as of December 31, 1919, is \$85,279,573.56.

### THE INTER-MOUNTAIN DISTRICT

**LIBBY, MONT.**—The Libby Water & Light Company will improve its plant and erect a dam.

**HINGHAM, MONT.**—This city has voted \$50,000 for a municipal water system and electric light plant.

**FIRTH, IDA.**—This community is endeavoring to secure electric service from the Utah Power & Light Company.

**RYEGATE, MONT.**—The Montana Power Company of Butte contemplates extension of its lines to this city for light and power.

**BOISE, IDA.**—The Idaho Power Company has asked the Idaho Public Utilities Commission for permission to increase its rates for irrigation pumping service.

**SALT LAKE CITY, UTAH.**—The Utah Power & Traction Company has asked the Public Utilities Commission for permission to increase its fares from 6c to 7c.

**HELENA, MONT.**—Among the big irrigation projects now proposed in Montana is one planned to reclaim 150,000 acres of land in Hill and Chouteau counties.

**SALT LAKE CITY, UTAH.**—Electrical interests of this city are seriously considering the formation of a cooperative association for the handling of general problems and building up the popularity of electricity in the intermountain territory.

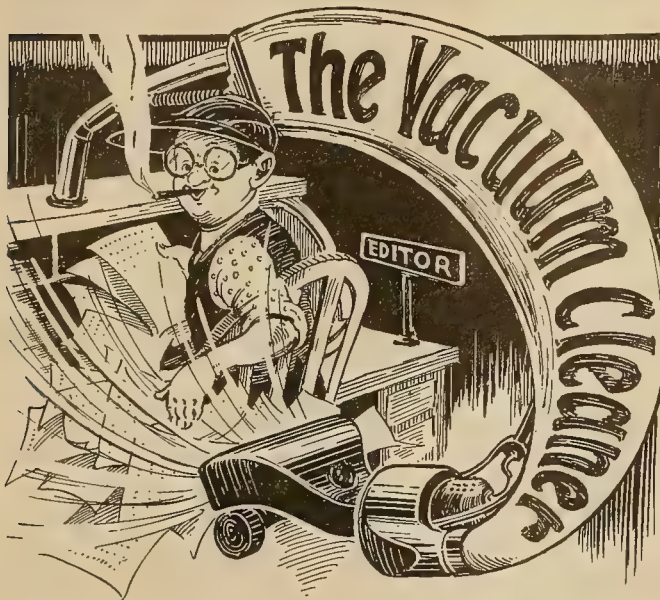
**HELENA, MONT.**—A hydroelectric power plant near Rimini, to generate power for operating a street lighting system of this city, is being considered by the city council. With wood pipe, the project will cost \$150,000; with concrete pipe, \$175,000, and with steel pipe, \$225,000.

**BRIGHAM CITY, UTAH.**—City officials are negotiating with the Utah Power & Light Company to ascertain on what basis current can be purchased for resale in this town. The city at present is unable to take care of demands for power on account of the limited capacity of its municipal plant.

**ARCO, IDA.**—The controversy between the Mackay Light & Power Company and the Ashton-St. Anthony Power Company, as to which company has the right to serve the village of Arco, has been finally settled by the Public Utilities Commission, which has ruled that the Ashton-St. Anthony Company have a prior right. It is the intention of the village of Arco to build a transmission line over a distance of several miles to tie in with the Ashton-St. Anthony Company's system.

**AMERICAN FORK, UTAH.**—Jed J. Mercer of this city plans to develop 1,000 hp. of electrical energy by a plant in American Fork canyon, according to a filing recently made with the state engineer. The application calls for construction of a dam from 25 to 30 feet high to store 500 acre feet of water, to be used as a supplementary supply during the low water seasons in the creek. To develop the power it is planned to take 20 second feet of water through a pipe line 30 inches in diameter and two miles long and use it under a 300-ft. head over two 3-foot wheels.





Golf gets into the blood in a most alarming way, according to a company which reports that its construction department, out on an electric extension, gets mixed in the names of tools and is discovered digging post holes with brassies and believing that the line can be built in less than 80. The complaint goes on pathetically:

"The bookkeepers keep track of how many strokes it takes to make out a bill and our general timekeeper figures on how many holes the employes have made instead of days work, while one of the contract department is figuring how many horsepower it will take to go around 18 holes on a 3-phase handicap and furnish 400 g. p. m. for raising alfalfa on the greens."

\* \* \*

Brevity being the soul of wit, we think the following message from a section foreman to the roadmaster should go on record:

"No 6 did not whistle. Please send me another hand car."

\* \* \*



"Dolly" Youdall, a prominent San Joaquin Valley contractor, noted for his amiable disposition, will possibly be recognized by many of his friends, who have met him in this frame of mind when trying to sell him something he didn't want to buy. This is his buying attitude.

\* \* \*

Is it unlucky to see the new moon for the first time through glass? to spill salt? to meet a black cat? Nobody seems to be very clear about it, but some wise soul has listed the following bad luck signs which you can prove for yourself:

A crack in your chimney is a sure sign that you are going to move.

If you dream of smelling smoke, it is a sign you are asleep and had better wake up.

To see a man hanging paper over a flue hole indicates an impending loss.

It is worse luck to look in a dark closet with a match than to see the new moon over your left shoulder.

If you can see your shadow from an oil lamp while filling a gasoline stove it indicates a crowd of people are coming to your house.

If you smell gas or gasoline and look for it with a light, it foretells that you are about to start on a long journey.

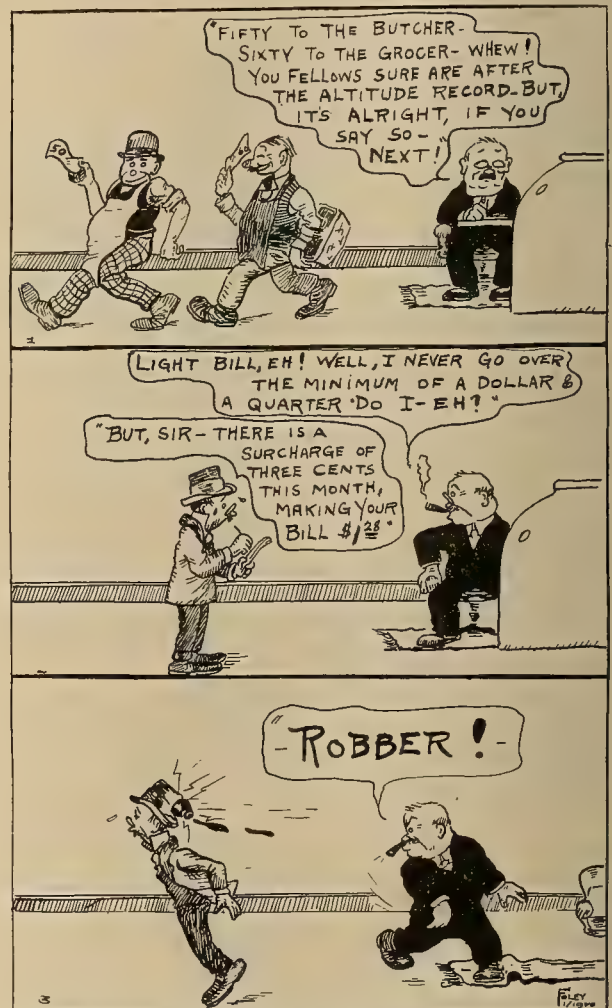
Even if your house and furniture are covered by insurance, it is extremely bad luck to have them burn on Friday the thirteenth.

\* \* \*

### LITTLE BOY BLUE UP-TO-DATE

O little Ben Zene, come blow your horn!  
You plow my meadow and hoe my corn.  
Till the hired men that I used to keep  
Look over the fence at my tractor and weep.

\* \* \*



### ONE MUST DRAW THE LINE SOMEWHERE

This picture reminds us of a touching notice which was seen hanging in the main office of a certain well known company:

"Our business has been established ever since 1858. We have been pleasing and displeasing people ever since. We have made money and lost money. We have been cussed and discussed, knocked about, talked about, lied about, held up, robbed, etc., to the end of the chapter. The only reason why we are staying in business is to see what the — will happen next."



IN THIS ISSUE: Analyzing Western Rainfall Data

# JOURNAL OF ELECTRICITY

VOL. 44 NO. 5

SAN FRANCISCO, MARCH 1, 1920

PER COPY, 25 CENTS



ough hydro-electric energy is  
ming to waste here in the  
ited States to equal the daily  
bor of 1,800,000,000 men."



# "Federal Electric" 20 Years of Integrity

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National Renewable Fuses  
Federal Bushings, etc.  
Hubbell Receptacles, etc.  
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V. V. Fittings  
Steel City Outlet Boxes  
Matthews' Lamp Guards  
Connecticut Cutouts, etc.  
Chelton Switches  
Duraduct Flexible Conduit  
Reliance Time Clocks  
Westinghouse Tape  
Rubber Covered Wire  
Rigid Conduit

## Appliances —

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Federal Vacuum Cleaners  
Heating Devices  
Westinghouse Fans  
Federal Lanterns  
Dumore Motor Devices

## Electric Signs —

Federal Signs—9 styles  
Federal Roof Displays  
Federal Interior Signs  
Reco Flashers and Hoods  
Thordarson Sign Transformers

## Electric Sirens —

Federal City Fire Siren  
Federal Industrial Siren

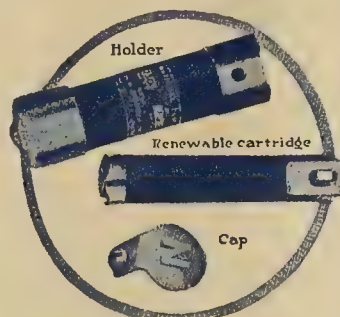
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Hubbell Shades  
X-Ray Projectors and Shades

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*Because* its powder packed refill prevents deterioration of the outer casing.

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# JOURNAL OF ELECTRICITY

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ROBERT SIBLEY, Editor

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## THE WEST CONTRIBUTES NEW AND INTERESTING SCIENTIFIC RESEARCH ON A NEW SOURCE OF POWER

A PROMINENCE 50,000 MILES HIGH, from a small section of the sun's corona, photographed at Mt. Wilson, California, with the spectroheliograph. The significance of the photograph may be judged from the fact that a study of the principles which make possible the continuous production of this energy may ultimately lead to the development of a new source of power by the electrical industry to meet the demands of the future. The West, through the particular advantages offered by its climate for astronomical observation and through the high order of scientific research which has been developed in its

Universities and Observatories, stands in the forefront in the advancement of scientific knowledge of our stellar and solar systems. The Lick Observatory at Mt. Hamilton near San Jose, California, and the Mt. Wilson Observatory near Pasadena, California, which houses the largest telescope in the world, are recognized internationally for their important contributions in the field of astronomical discovery and in the development and testing of theories which hold so much significance for the practical fields of applied science.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

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## THE WEST AND THE CABINET

**N**O MAN OF THE WEST is now in the cabinet of President Wilson. It had been hoped that when Secretary Lane's successor was chosen, he at least would be a Westerner. The reasons for such a well-founded wish on the part of the people this side of the Rocky Mountains were set forth in the last issue of the Journal of Electricity. No cabinet officer has so much to do with supervision of the development of the West's resources as has the Secretary of the Interior. In hydroelectric power development especially his influence is dominant.

The West unquestionably wanted a young, progressive Western man to fill this important administrative post. By preference, it wanted an engineer; or, failing that, a man with the engineer's broad outlook upon affairs. It desired such a man as might fittingly head a Department of Public Works, were it created to take the place of the Department of the Interior, as so strongly urged by engineering organizations all over the United States.

John Barton Payne, of Illinois, has been chosen as the new Secretary of the Interior in President Wilson's kaleidoscopic cabinet. As a lawyer and as an administrator, Colonel Payne possesses acknowledged ability. Nevertheless, his capacities were already well employed in his service as chairman of the United States Shipping Board. It is with keen

regret that the West finds that its well-known desires in this matter were disregarded.

This is the year of the Presidential Election. Let the West make it clearly understood now that whatever party may thereby come into power, it is determined to have a Western man in this position of Secretary of the Interior.

There is an unfortunate tendency, at the present period of scant precipitation in California, to attempt to cast doubt on the importance of hydroelectric development in the future of the state. Conditions which are by no means typical cannot logically be cited to the disadvantage of water power exploitation; they simply emphasize the fact that there must be built up a system which will insure adequate power "reserves" at all times. No one will deny the immense utility of steam plants in California; even in normal times they generate 27 per cent of the power in the northern part of the state. But compilations of rainfall data for past seasons show that not one year in twenty-five will they need to be more than auxiliary to hydroelectric plants.

Even at the present time, when a shortage of power appears imminent, it is well for California to recognize the tremendous service which hydroelectric power is doing to maintain the general prosperity, and what it will continue to do. In the first place, the energy now being used in pumping for irrigation in the great central valleys is mainly transmitted from the mountain generating plants. Although little rain has fallen, the field crops and orchards are thus saved from disaster by utilization of hydroelectric energy in lifting underground waters. Fresh feed for livestock is thereby assured

even in an abnormally dry period. Well may it be asked at this time, What would agricultural California do in a dry year without hydroelectric energy?

The vast storage of waters in connection with the power industry proves likewise of immense economic value to the state in times of drought such as these, since most of the controlled waters may be utilized also for irrigation purposes. If it were not for hydroelectric development in the past, it is probable that these waters would have been allowed to run to waste.

The transmission of hydroelectric power from one part of the state where rainfall has been ample to another part where it has been scanty is now practical. This amounts virtually to a transference of stored waters from place to place, according as they are needed. Such a "grand averaging" of the benefit of rainfall would be impossible were it not for the interconnecting transmission lines which have been constructed by power companies throughout the whole length of the state.

As to manufacturing and industry, it is well known how much they owe to water power development. Probably half of the factories in California today would not be in existence were it not for the agency of hydroelectric energy. Surely, even if they were obliged to reduce their output temporarily for part of one year, they are more than compensated by the abundance of cheap power which is available



in a long succession of years. They are certain to lose more by strikes in the next ten years than they ever will through power shortage.

Realizing its great services, and taking into account the possibilities for water storage in the Sierras on a gigantic scale, let it be recognized that hydroelectric development will probably never take a secondary place in California.

Again we ask the question, Where would California be were it not for its harnessed water power?

The strenuous days of war have left their lessons on all sides. Not the least among these lessons

#### A Research Reference Bureau

are those they taught in holding before the vision of every utility operator the necessity for saving and for a continued effort to

bring about economies of all sorts. Many utility commissions undertook special research work during the war period to show how savings might be accomplished in fuel. Particularly was this true in California where the California Railroad Commission brought forth unusually helpful data on the subject of petroleum and its conservation. The whole subject now comes up for review, and many engineers are now discussing the advisability of making it possible for the regulating commission in each commonwealth to act as a reference research bureau of some nature. It would seem that institutions such as public utility commissions offer unusual opportunities for the collection of data of this sort, and that they are best in position to dispense needed information on problems that affect the body politic generally in matters that pertain to utility service.

Coastwise shortage of precipitation unparalleled in the past twenty-five years and growing more acute

#### Shifting the Load

as the season progresses, following directly upon three years of embargo upon hydroelectric development as the result of war

conditions, has resulted in a stringency of power supply, which can only be met by a scientific shifting of the agricultural load by the generating companies.

Power experts of regulating bodies, and of the power companies, are engaged in an earnest endeavor to so distribute the available hydroelectric energy during the peak months of agricultural demand—July, August and September, that crops will not suffer for want of irrigation; manufacture will not be interfered with, nor lighting or domestic service curtailed.

War demands have increased production enormously, in some instances as high as 40 per cent, which is very largely reflected in irrigation requirements. Upon the great power generating companies rests the overwhelming responsibility of protecting the production of food stuffs from the land, and keeping the wheels of industry in motion, and the thousands of employes depending upon them, at work.

Conservation of electric power is the big question of the moment and in Southern California, a

large generating company which supplies energy to many counties has worked out a tentative plan which appeals to regulating and commercial bodies as just, equitable and for the public good. It has pointed out that conservation of power can be largely effected through night irrigation, the advantages of which are the lessening of water losses through evaporation, making a larger stream available, and that the water applied to the land after dark is of a warmer temperature and permeates through into the soil, more of it thus returning to its underground source.

The detail of the plan for conserving agricultural load during the summer months is substantially as follows: To alternate the operation of plants operating fifteen days or less per month, and limiting the operation of plants that operate more than fifteen days per month, to operation during non-peak hours; commencing at 8 p.m. and working until 6 a.m. on week days, no embargo being placed on Sunday irrigation.

This plan works in perfect harmony with a program under consideration by the United States Department of Agriculture for conserving the water by night irrigation. It has been demonstrated that agriculturists who cooperate in the working out of this plan will be assisting not only themselves, but that all other consumers of electric power will avoid the curtailment of irrigation and new development.

The whole idea is a new one, but is in line with the conservation of energy and the lowering of the high cost of living, and we heartily commend the movement now under way, as it would undoubtedly aid in this regard.

In view of the necessity for formulating adequate financing plans for electric power plant development in the West, great interest

#### Selling Stock on Self-Interest Plan

attaches to the stock-selling campaign just launched by the San Joaquin Light & Power Corporation.

The keynote of this campaign is the "Self-Interest Plea," so ingeniously evolved by A. Emory Wishon, assistant general manager of the company and president of the Pacific Coast Section, N. E. L. A. As explained in past issues of the Journal of Electricity, this plan shows clearly to each element of the community its self-interest, in actual dollars and cents, in further power development. For the San Joaquin Valley area, in which his company operates, Mr. Wishon has drawn up accurate charts and tables indicating how each branch of manufacture and industry will directly benefit through the construction work planned in the next few years. With this as a basis, the first endeavor will be made to sell the stock of the company mainly within the prosperous territory which it serves.

The campaign opened with heavy advertising in the San Joaquin Valley newspapers. At the same time letters were sent out to the 37,000 consumers of the company, informing them of the terms of the stock-issue and pointing out its advantages to investors. The company's district agents will themselves act as stock salesmen; and to follow up inquiries



there will be a special corps of active young salesmen, educated by the company particularly for this "drive." The banks will also cooperate.

The unique features of this campaign will cause it to be watched with utmost attention by the power companies of the West, who are eagerly seeking the best methods to promote their forthcoming stock sales. The directors of the enterprise are setting about their work with characteristic energy, and it is to be hoped that they will succeed in opening up a new way to gain public financial support for such necessary expansion.

The value of advertising for the merchandising end of the electrical retail business is well recognized. Not only does this featuring of the individual merchandising center bring returns in actual sales, but the standing of the whole field of electrical retailing is thereby raised in the mind of the community. Unfortunately this wise policy of publicity has not yet been widely extended to the contracting end of the business. In very few instances has the electrical industry taken the trouble to educate the building public as to what constitutes desirable wiring—and with the general lack of information, the matter is left entirely in the hands of the architect or, more often, with the general builder and contractor who may or may not know his client's best interest in electrical installation. The proposed campaign on convenience outlets which is intended to fill this very need, is after all primarily a contracting affair and one in which the contractor should take his share of the responsibility.

Aside from the stimulation to the electrical contracting business itself which would result from a widespread campaign of publicity, such a step could not but affect favorably the condition and standing of the entire field. There is nothing like facing the facts of an advertisement to make a man check up his business methods. There would be fewer haphazard businesses conducted at odd moments from the home basement and more standard bookkeeping systems installed, if the business in question must face the need of truthfully representing its claims for patronage in black and white before the world. A concern whose name was familiar through such publicity, moreover, would be raised in the estimation of the customer, an influence which would be felt throughout the entire field.

The unusual feat which has been brought about in recent months in certain power plant installations of the West where oil has been used as a fuel, indicates in a very emphatic manner the possibilities of increasing still further the economies of steam power plants throughout their entire working period. This can be brought about provided a reward for service be held out to spur companies to action, and in some way stimulate the enthusiasm of the operator. Long since there has been inaugurated in such cities as Chicago a

system of reward for the saving and operation of street car traffic, and the institution of such a system in power companies generally, wherein a saving is brought about for the public served, and a reward for this saving given to the power company bringing about such an installation, is truly to be commended.

The break in the trans-Pacific cable between Midway Island and Guam brings to a climax a condition which has long been of immense detriment to this country. The inadequate trans-Pacific cable facilities and the continued curtailment of commercial radio service to and from the Orient have already caused very heavy financial losses to American business interests in general, and to those on the Pacific Coast in particular. The situation has rapidly grown worse, until now there is a state of practically complete paralysis of our telegraphic service with trans-Pacific countries.

Immediate and effective action was imperative to relieve this intolerable situation. It is with gratification therefore that we learn that the Navy Department on February 29th released and returned to private control these radio stations for trans-Pacific commercial service. Information from reliable authority shows that privately owned systems can give quick and substantial relief to the situation, without interference with Navy radio communications; also that this service will be greatly improved at a very early date under private control.

Aside from the individual benefit which a member of the industry may gain from the electrical association to which he belongs, there is to be reckoned a very considerable prestige which such organizations gain for the industry as a whole. The association may be made the point of contact with the public, and especially with the official representatives of the public. In the halls of legislature, the voice of a powerful organization is listened to with respectful attention where the word of an individual might go unheeded. This is particularly the case when the association represents not one branch of the industry alone, but is made up of all elements within it.

Typical of the kind of organization we have in mind is the San Francisco Electrical Development League, having a membership of 300 active business men associated with electrical affairs. A month or so ago the composition of this body was announced as follows: Contractor-dealers, 12½%; jobbers, 19½%; power companies, 18%; manufacturers, 35%; technical journals and others, 15%. This may not be the ideal combination; in fact, at first glance, it would appear that there should be a large enrollment of contractors and dealers. Yet it shows what has been attained in cooperation by this association, which holds very successful weekly luncheon meetings for consideration of topics of live electrical interest.

### Extending Advertising to Contracting

### Commercial Radio Release Great Help to Trade

### Electrical Development Leagues

### Reward for Increased Efficiency



As a concrete instance of how much such an all-inclusive organization may accomplish, the case may be cited of how the Electrical Development League last year favorably affected action on the Electrical Inspection laws before the California legislature.

What has been achieved in San Francisco can be attained also in other Western centers of population. Los Angeles and Portland have organizations of this sort which should not be allowed to languish, for they fill a very real need in their communities and may on occasion do yeoman service to the entire electrical industry.

If we continue to use coal at our present rate of consumption, the available supply, it is estimated, will last some 4,000 years. If we continue to increase our use of fuel in the same ratio that we have during the last half century, however, we shall have exhausted our supply within one hundred years and long before that time, will be reduced to most inferior grades of the product. The limits to fuel oil production are already keenly realized. Even with utmost consideration, our supplies of these natural fuels will inevitably be exhausted and it is none too early to begin to look for another source of energy for future generations. Water power, fully developed, will supply only a portion of the illimitable desires of man; growing substance in almost every case can serve a more useful purpose to man than to burn as a fuel direct.

The most natural source of energy to which we can turn is the sun. Neglecting all energy radiated into other realms of space, the energy which reaches the earth alone from the sun amounts to 500,000 kw. per square mile of earth's surface. If this energy already existing as electromagnetic energy could be utilized in the generation of electrical energy, as we usually apply it in agriculture and industry, unquestionably the problem of the power for future ages will have been solved. More important than this, however, the nature of the origin of this tremendous output of energy is still a mystery to the scientists. When it is discovered, it may be possible to reproduce conditions here on earth which will in a small way parallel those of the sun and so give us a new principle of energy release. One theory of the sun, for instance, supposes its heat to originate in

the release of the energy of the atom at very high temperatures, a process which has not yet been reproduced in the laboratory, but which is not inherently impossible.

The present state of astronomical knowledge on the subject is most interestingly presented by Dr. Anderson, of the Mt. Wilson Solar Observatory, on another page of this issue. Through the work of the Mt. Wilson observatory, under the able direction of Dr. George E. Hale, the West has contributed the most important advances in the study of the sun of recent years, and to the studies carried on by Western men in this observatory we may look for the ultimate solution of a problem of vast interest to the electrical industry.

The American Institute of Electrical Engineers is now going through a trying period in the life of the national organization. The difficulties consist largely of a lack of sufficient money to meet either the present requirements of the association or, what is of much greater importance, the needs of future expansion. Within the past few months several steps have been taken to rectify the trouble: The development committee has made a survey of the situation and part of the report—that pertaining to a change in the size and general character of the monthly publication—has already been put into operation. Another part appertained to the problem of increasing the membership in the higher grades particularly and all of the grades generally. This latter proposition can only be met by the membership committees of the sections. In another part of this issue is an announcement by the membership committee of the San Francisco Section; this applies with equal force to all the sections, and it is urged upon all A. I. E. E. members to get busy and actively push the membership campaign in their districts.

The real way to get additional members for this society, as well as any other, is to show in a concrete way what a man has to gain by membership. This may be best shown by the enthusiasm of the meetings and the class of programs presented. Every member has the responsibility on his own shoulders of helping the Institute by attending all the meetings and contributing to the discussion of the papers presented.

## Special Features in the March 15th Issue:

### THE UPS AND DOWNS OF THE CONTRACTING BUSINESS

—dramatically presented by the electrical contractors of San Francisco in a clever play written by L. R. Ardouin

### BRINGING BUSINESS TO THE SIDE STREET

—a story of success in the use of electric signs for an electrical business in Sacramento

### THE RECORD OF 100 DAM FAILURES

—a valuable compilation of dam failures, with dates, causes so far as ascertained, and references

### THE USE OF ELECTRICITY IN WESTERN MINES

—technical aspects of the electrification of the mining industry in the West, by B. B. Beckett



# The Sun as a Source of Energy

BY DR. J. A. ANDERSON

(The earth receives about 500,000 kw. of energy per square mile from the sun. If this could be utilized directly, or if a study of the sun can show how the tremendous energy of the atom may be released in the laboratory, the power problems of the future are solved. At present, though all hypotheses considered are defective, the subject presents a vast field of study which is of the greatest importance to the electrical industry. The author is one of the scientists on the staff at the Mt. Wilson Observatory.—The Editor.)

We may list our primary sources of energy or power as follows:

1. Direct radiation from the sun.
2. Atmospheric and Oceanic circulation (including "water-power").
3. Products of present vegetable and animal life.
4. Products of ancient vegetable and animal life.
5. The tides.
6. Earth's internal energy.
7. Atomic disintegration.

Obviously, 2 and 3 are derived from 1, and 4 came from 1 in the past; it is probable that 6, at least partly, is derived from 7, so that this classification is not in any sense exclusive, but is set down here merely for convenience. We note that 1, 2, 3 and 4 originate in the sun; 5 and 6 are terrestrial, while 7 is general, being a special property of matter in some of its forms.

At the present time practically all the energy used for power purposes comes from 2, 3, and 4, and by far the greater part from 4 alone. That this state of affairs cannot continue indefinitely is obvious since the amount of energy stored in coal, oil and natural gas deposits is limited; the importance of 2 and 3 will therefore increase as time goes on, and this raises the question whether these will be sufficient for our ever increasing needs. So far the attempts to utilize the sun's direct radiation, the tides or the earth's internal energy for power purposes have met with little success, and the seventh subdivision although it gives us a glimpse of perfectly immeasurable amounts of energy, is at present merely a scientific curiosity, and can therefore not yet be regarded as a source of power.

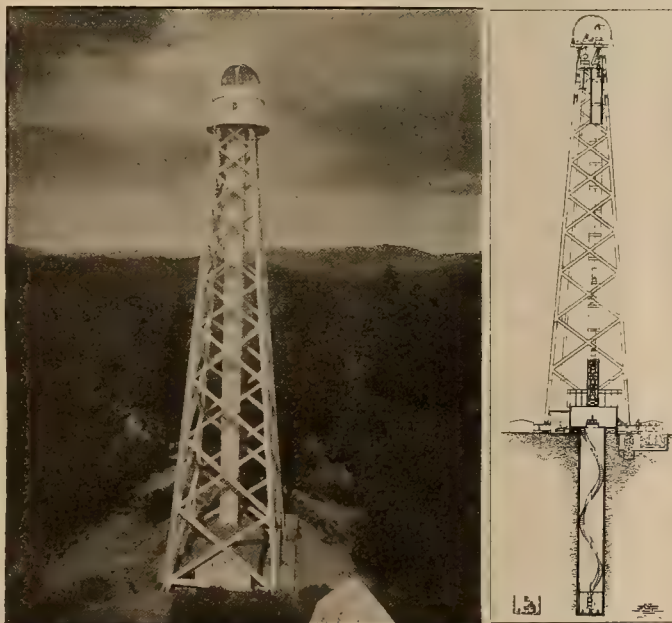
As probable sources of energy for future generations the tides and the interior of the earth can scarcely be considered in comparison with the sun's direct radiation; the amount of energy stored in the earth, though imposingly large in terms of ordinary power units, is absolutely insignificant when compared to that given out by the sun.

The energy radiated

from the sun has frequently been stated, but often in terms of units which the engineer does not ordinarily employ. Taking Abbot's value of the solar constant, 1.94 calories per square centimeter per minute at the earth's mean distance, it is readily found that the sun's total radiation is  $38.7 \times 10^{22}$  kilowatts, and the energy intercepted by the earth is  $17.6 \times 10^{13}$  kilowatts. In other words each square mile of the earth's surface receives on the average 500,000 kilowatts continuously from the sun. If but a very small fraction of this could be utilized for industrial purposes it is evident that the question of future supply of power would be definitely solved. But, even so, the human mind would not be satisfied; it would at once begin to seek the source of this energy in the hope perhaps of being able to supply itself directly without the intervention of the sun. It becomes a question of the possibility of reproducing solar conditions in the laboratory.

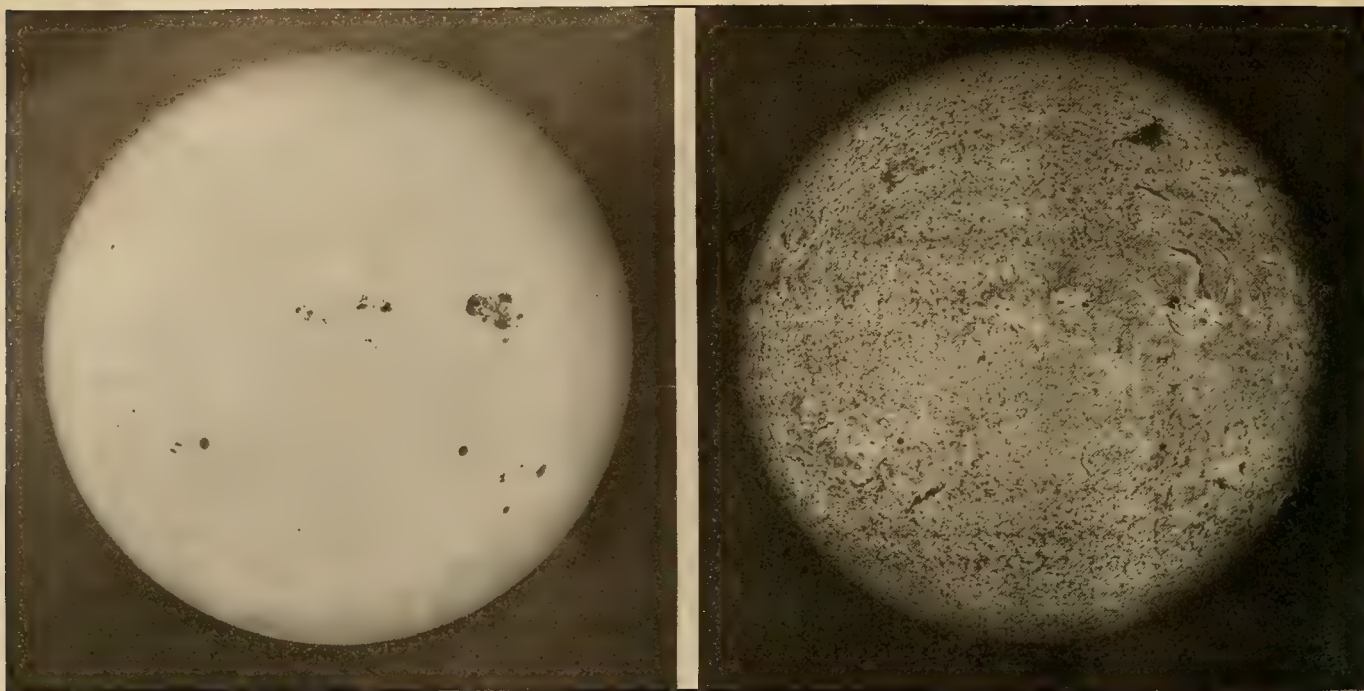
A very important characteristic of the solar radiation is its constancy in the long run, in spite of the fact that in periods of a few days, or weeks at most, it may vary to the extent of several per cent. There is also a suspected variation in the period of the sun spot cycle, though this appears to be rather small. These variations have recently been brought to light by precise measurements of the solar constant made by Dr. C. G. Abbot and his co-workers at various stations of the Smithsonian Astrophysical Observatory. The constancy of the average radiation

is shown by the constancy of the mean temperature of the earth. The distribution of vegetation, and especially the time of ripening of crops, are known to be sensitive indicators of the mean temperature during the growing season, and botanists have collected historical records to show that the earth's present mean temperature can hardly differ as much as a degree centigrade from its value some two thousand years ago. Now, a change of one degree in the earth's mean temperature corresponds to a change of only 21 degrees in the effective temperature of the sun. Unless, therefore, the



The specially constructed 150-foot tower telescope at the Mt. Wilson Observatory which gives a specially large and sharp solar image and makes observation possible throughout the day. The line drawing at the right shows the location of the powerful spectograph mounted in a deep well under the tower.





Two photographs of the sun taken at the same time, that on the left being direct, while that on the right was taken with hydrogen light only, using the spectroheliograph. This instrument, which was developed by Director Hale at the Mt. Wilson Observatory, has enormously advanced the possibilities of solar observation. The two pictures show clearly the increased detail obtainable with the spectroheliograph.

earth's atmosphere has changed considerably in the past 2,000 years, which does not seem probable, we have every reason to believe that the sun's mean effective temperature is the same today that it was 2,000 years ago within about  $20^{\circ}\text{C}$ . At the same time Abbot's results show that in a few days the actual temperature of the sun may change by several times  $20^{\circ}\text{C}$ . Obviously a theory which is to account for the origin of the sun's energy must also be able to account for these rather sudden changes in the rate of radiation, as well as for the secular constancy of the mean radiation.

The simplest hypothesis, though it has never been proposed seriously, is that the sun is merely a hot body cooling off by its own radiation. If its specific heat were as high as that of water a simple calculation shows that its temperature would fall  $1.5^{\circ}\text{C}$ . per year, so that in about 14 years the earth's mean temperature should have fallen  $1^{\circ}\text{C}$ ., which is, of course, ridiculous.

The well known fact that the radio-active elements are continually liberating energy as a result of their own disintegration suggests that if these elements were present in the sun in sufficient quantities we might arrive at a satisfactory explanation. Not so, however. Referring to the data of radio-activity we find that uranium and thorium are the parents, so to speak, of the two radio-active families, so that the amounts of the most active members such as radium and actinium are determined by the amounts of uranium and thorium. In other words, a sun composed of pure radium is impossible in the light of present knowledge. We also know that if uranium is present in the sun at all, it is in relatively very small quantity.

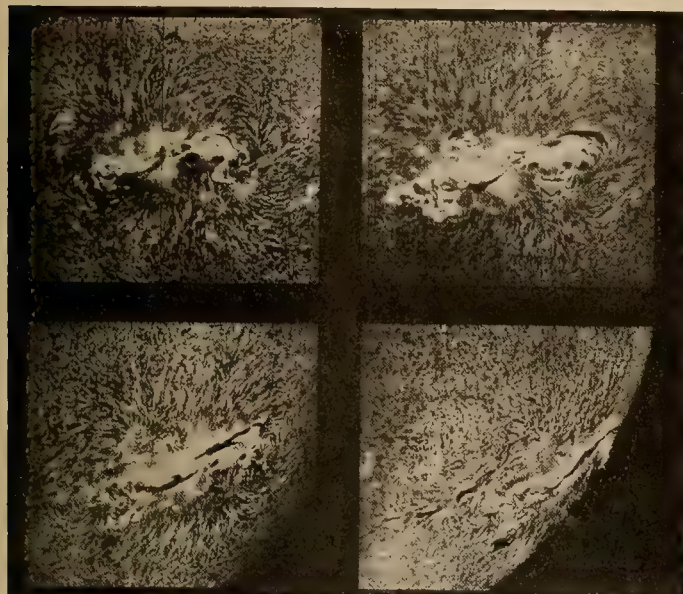
The theory which has received the most careful study is the contraction theory of von Helmholtz. This view assumes that in the beginning the sun was

an immensely expanded gaseous mass, filling perhaps the entire space now occupied by the solar system, exactly as was supposed by Laplace in his Nebular Hypothesis. Laplace, however, thought the original nebula was extremely hot, while von Helmholtz assumed it to have a relatively low temperature. Such a mass would contract as a result of its own gravitational field, and hence its temperature would rise, the decrease in potential energy due to the contraction reappearing as kinetic or heat energy in the mass itself. As the temperature rises, some of the heat energy is lost into space by radiation, but the laws of physics show that not more than one-half of the amount produced can be so lost. It is not a difficult matter to calculate the amount of heat energy developed while the sun contracted from its original large size to its present dimensions, and it is found to be sufficient to raise the whole mass some  $27,000,000^{\circ}\text{C}$ . on the assumption of a specific heat equal to that of water. Half of this amount might have been radiated during the process, so at the present time the sun's mean temperature should be something like  $13,500,000^{\circ}\text{C}$ . Further contraction might increase this somewhat, but contraction must inevitably cease, after which the mass simply cools off. Since the present rate of radiation would lower the temperature of the whole mass  $1.5^{\circ}\text{C}$ . per year, it follows that on this theory the sun cannot have maintained its present rate of radiation for even so long a time as 10,000,000 years. Now, it has been practically demonstrated that some of the rocks forming part of the earth's crust must be hundreds of millions of years old, and we can hardly assume the sun to be younger than our own rocks.

There remains the so-called meteoric theory, and this can be easily understood from the following considerations: Let a small material particle fall freely from some point in interstellar space, toward



the sun, acted on only by the latter's attraction. When it reaches the solar surface it will be moving with a speed of about 370 miles per second, and its kinetic energy amounts to roughly 40,000,000 calories per gram of its mass. Its motion will be arrested by the sun's atmosphere, and its kinetic energy will



Hydrogen whirls in the solar atmosphere above a group of sun spots, photographed with the spectroheliograph at two-day intervals. The spectroheliograph, by making it possible to isolate the light coming from one element, using for instance only the light of the red hydrogen line, has permitted great advances in the investigation of the different elements and their phenomena.

appear as heat energy. Given enough meteoric particles it is evident that the sun's radiation could be accounted for in this way, and as the sun's yearly radiation is  $3 \times 10^{33}$  calories we find for the amount of meteoric matter required the enormous value of  $7 \times 10^{25}$  grams per year.

Examining this meteoric theory from a quantitative point of view we find it to be insufficient. In the first place, if actually  $7 \times 10^{25}$  grams of matter were added to the sun yearly, its rapid increase in mass would change the rate of motion of the planets to such an extent that astronomers would not fail to discover it in a very short time. Secondly, from observations of the amount of meteoric matter falling on the earth, we can estimate pretty closely how much actually falls into the sun, and this can hardly be greatly in excess of  $10^{20}$  grams per year, or say about 1/1,000,000 of that required by the theory.

We are therefore quite unable to "explain" the origin of the sun's energy unless we are willing to adopt one or the other of these alternatives:

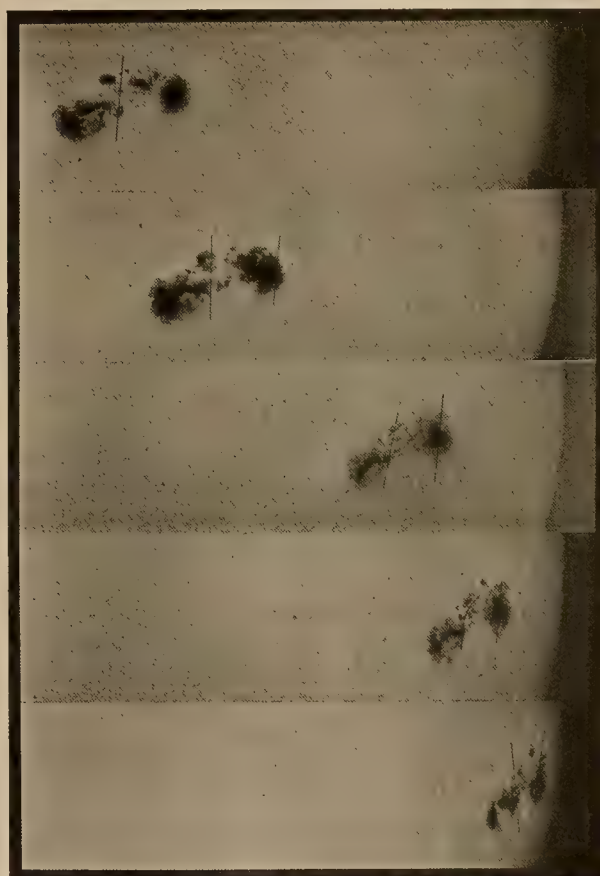
1. Radiation does not proceed from a source equally in all directions, but is confined to lines joining the source to other particles of matter.

2. At very high temperatures atomic disintegration sets in, liberating the enormous supply of energy known to be stored inside the atoms.

Since the first alternative is not attractive, let us confine our attention to the second. The hypothetical atomic disintegration would of course take place at the point where the temperature is highest. On

the contraction theory this would be at the sun's center, while on the meteoric theory it would be near the outer limits of the solar atmosphere. If we place it at the sun's center we encounter many difficulties. Before the energy could be radiated it would have to pass through the greater part of the 432,000 miles of rather dense matter intervening between the center and the solar surface. Any irregularities in the rate of production would thus no doubt be smoothed out, so it would be difficult to account for the rapid variations found by Abbot. If we place it at the surface in accordance with the meteoric theory, this difficulty at least would be avoided.

The importance of determining the nature of the source of the sun's energy from the electrical standpoint, of course, is the possibility of reproducing these conditions on the earth. If the sun's energy is due directly to its gravitational field, or, in other words, due to its great mass, then it is futile



Photographs of a large bipolar sun-spot group carried across the solar disc by the sun's axial rotation, showing the change in the position of the neutral line with the change in longitude of the spot. The sun-spot is a seat of a magnetic field, the strength of which varies with the size of the spot, and may be as high as 4,000 to 6,000 gilberts per sq. centimeter, a strength which presupposes the circulation of a tremendous electric current in the sun-spot.

for man ever to dream of imitating it. If, however, the gravitational field merely plays the role of an assistant in the liberation of energy then it may be possible to find some physical agent capable of taking the assistant's place.

It would be fascinating to pursue this speculation further, but since atomic disintegration is quite unknown in the laboratory, excepting the spontaneous disintegration of the radio-active elements, we must await results of further experimental work.



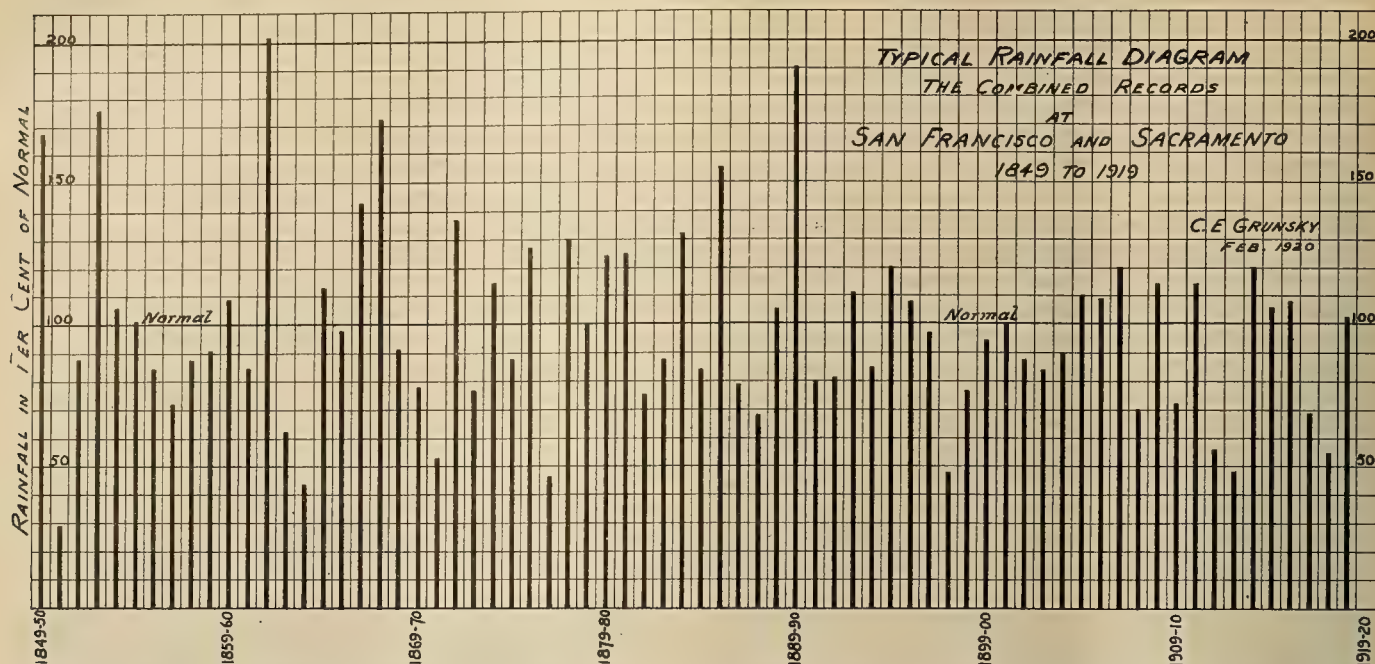


Fig. 1. Diagrammatic presentation of the percentage figures in Table I, showing the combined rainfall records of San Francisco and Sacramento from 1849 to 1919. The combination of records is a more accurate guide to the conditions prevailing over a large area than are the records of any single station.

## Some Notes on California Rainfall

BY C. E. GRUNSKY

(Climate is a more vital factor in a district which depends upon the produce of the soil than it is in a manufacturing district. For this reason the question of rainfall in California is very closely bound up with the state's prosperity, not only because of its direct influence upon irrigation and general water supply, but indirectly through its connection with hydroelectric power and the agricultural and industrial development dependent thereon. The following interesting discussion of the subject by a well-known civil engineer of San Francisco is of especial timely importance.—The Editor.)

Probably in no other state does the public keep tab on the rainfall as closely as in California. It has always been so. Ever since the discovery of gold there have been important industries and occupations dependent on abundant rainfall, and there have been large areas and much property menaced by the floods resulting from occasional excessive rainfall. The winter run-off brought life to the mining camps in the early history of gold mining in California, where the placer soil and gravel of the diggings were washed from the gold by its aid. Plenty of water meant plenty of gold in those early days. Now the irrigator and the power plant owner and the city which draws upon surface sources are all interested. Will the season be wet or dry, is the annual question as winter approaches. What is more natural, therefore, than to find the public generally given to prognosticating and interpreting signs. They study the moon to see whether it is a wet or a dry moon, they base predictions upon the early or late flight of geese from the Arctic regions, or upon the summer temperature, or they will even venture predictions on sun spots or on the six months earlier climate of far-away Europe. It need hardly be said that no dependable basis for a rainfall forecast has yet been found, and that for the present the scientist can do no better than the practical man, who is content to determine probabilities on the basis of the records which disclose the weather conditions of the past.

### Available Records

The rainfall records which are available in California are exceptionally good. The importance of the rain and snow as an economic factor was recognized by the early settler, with the result that good records were kept, so that the character of the seasons since 1849 in the matter of rainfall is fairly well known for all California. The concentration of most of the precipitation into a winter period of six months with wide departures from the mean, lent a peculiar fascination to the collection of these data which now facilitate comparisons and which have aided in no small degree in determining local limitations upon dry farming, farming by irrigation, and more recently the limitations upon power output. Such observers as Dr. Thomas M. Logan of Sacramento and Mr. Thos. Tennent of San Francisco, whose records beginning in 1849 have been preserved, have rendered a valuable service to the communities in which they lived and to the entire state. With the aid of their records to supplement the more recent government records, and with others somewhat less complete and dependable, and with many more or less fragmentary records scattered throughout the state, it has been possible to determine with some approach to the truth what the normal or mean annual rainfall is in practically all parts of the state, and it has also been made possible to give for almost any locality a fairly dependable approximation of the



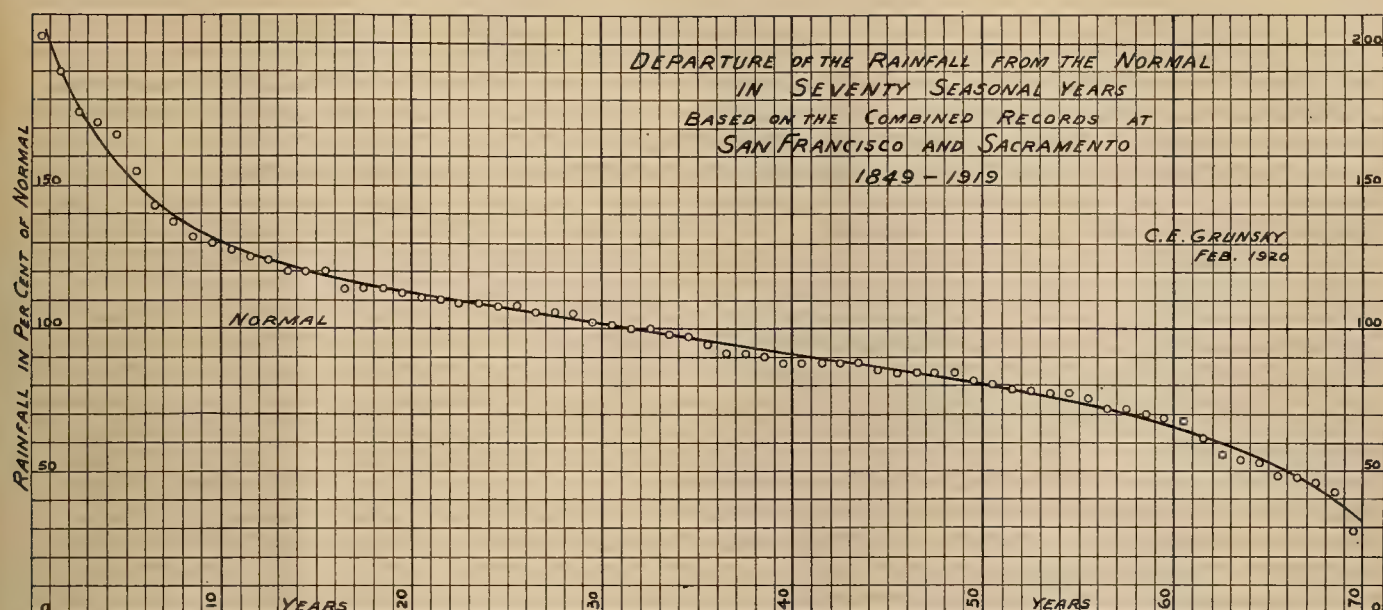


Fig. 2. Curve indicating the departure of the rainfall from normal over a period of seventy seasonal years, and the average frequency of very dry and abnormally wet years.

precipitation in any seasonal year. The term seasonal year is here used to express the twelve months beginning with July. The distinction between the rainfall in a calendar year and in the seasonal year is very important for the Pacific Coast region because the six months during which nearly all of a season's rain falls represent a period which overlaps from one calendar year into the next. It would be meaningless in California, therefore, to compare the rainfall of calendar years with each other. It has here become the universal custom to note the rainfall for the seasonal year. It is this rain which must be given credit for the season's runoff and all that this may mean in the matter of floods, and irrigation and power output.

#### Differing Conditions in North and South

When now a season, as the present one, comes along with a very light rainfall—now in the central portions of the state only about 31 per cent of normal,—the question is uppermost in everybody's mind, "What will the rest of the season bring?" Some of the facts which should be considered in making an estimate of probabilities for more rain this season are here briefly presented. It must be remembered, however, that there is an old saying in California that "in dry seasons all signs fail," and that any probabilities which figures may indicate should be discounted somewhat. It appears that in the years, meaning seasonal years, which have materially less than normal rainfall to their credit, the paths of the storms which bring rain are persistently farther North than in years of abundant rainfall. In such seasons the storms which cross Mexico may bring rain to southern portions of California. Such southern rain storms may, therefore, in a season like the present, which is a dry one for central and northern portions of California, bring to the south enough rain to offset in a measure the deficiency due to the high latitude at which the northern storms reach the continent from the Pacific Ocean. So, in this season of 1919-20, we find that San Diego has received 60% of the normal rain to date, February 14th, and Los

Angeles 56%, while in the northern and central portions of the state the precipitation has been, as above stated, only about 31% of the amount which would have fallen to date in a normal year.

The normal annual precipitation in California has a wide range. In the southeastern part of the state the normal rainfall is only 2 or 3 inches, while at some points on the western slope of the Sierra Nevada and in the extreme northwestern part of the state, and also at some places in the Coast Range, the mean annual precipitation may reach upwards of 80 inches. The variation from year to year is also great. Wherever, for example, the normal annual rainfall exceeds 20 inches it will be safe to assume that there will be some seasonal years with less than 40 per cent and others with as much as 200 per cent of the normal.

#### Evidence Supplied by Collected Data

In making studies of rainfall probabilities it will be found convenient to use percentages of the station normals rather than the actually observed amounts of rain. Thus, for example, in discussing the rainfall in a certain central portion of California, the records at San Francisco and at Sacramento may be combined. This combination is useful because several records combined are a better index of what is taking place in the matter of precipitation over a

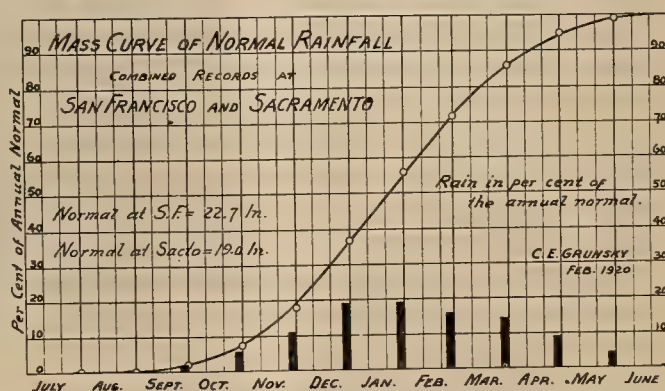


Fig. 3. Average normal rainfall by months for San Francisco and Sacramento, expressed in per cent of the normal seasonal rain.



large area than a single station record. The combination is justified because the storms which bring the rain to the Pacific slope are of vast extent, and considered in annual totals, the amount of rain at one station in the same drainage basin will generally bear a fairly permanent relation to the amount at any other. Any relation thus determined can, therefore, be used to amplify incomplete records and may serve, too, when normals are known in any locality to expand these into annual records for the same period that the records at a base station are available. But returning to a consideration of the variation in the annual amount of rain, Table 1 has been prepared to show the rainfall at San Francisco and at Sacramento since 1849, expressed in percentage of the normal, instead of as is customary, in inches. The normal rainfall at San Francisco is 22.7 inches and at Sacramento it is 19.0 inches. The percentage

TABLE I  
Seasonal Rainfall at San Francisco and Sacramento  
For the Period 1849 to 1919,  
Expressed in Percentage of the Normal Seasonal Rainfall  
Normal at Sacramento, 19.0 inches  
Normal at San Francisco, 22.7 inches

Seasonal Year	PER CENT OF NORMAL		
	San Francisco	Sacramento	San Francisco and Sacramento Average
1849-50	146	189	168
50-51	33	25	29
51-52	81	95	88
52-53	155	191	176
53-54	105	106	106
54-55	104	98	101
55-56	96	72	84
56-57	88	55	72
57-58	97	79	88
58-59	97	85	91
59-60	99	119	109
60-61	86	82	84
61-62	217	187	202
62-63	60	63	62
63-64	45	41	43
64-65	108	118	113
65-66	101	94	98
66-67	153	133	143
67-68	171	172	172
68-69	94	85	91
69-70	85	71	78
70-71	62	44	53
71-72	153	121	137
72-73	80	73	77
73-74	105	123	114
74-75	81	95	88
75-76	115	138	127
76-77	44	47	46
77-78	137	123	130
78-79	108	91	100
79-80	116	131	124
80-81	121	129	125
81-82	69	80	75
82-83	87	89	88
83-84	140	124	132
84-85	80	87	84
85-86	139	170	155
86-87	83	74	79
87-88	74	61	68
88-89	105	105	105
89-90	202	178	190
90-91	78	83	80
91-92	81	80	81
92-93	96	126	111
93-94	81	89	85
94-95	113	127	120
95-96	94	122	108
96-97	102	91	97
97-98	41	55	48
98-99	74	79	77
99-00	81	106	94
1900-01	93	106	100
01-02	84	91	88
02-03	80	87	84
03-04	91	89	90
04-05	103	116	110
05-06	91	126	109
06-07	114	126	120
07-08	76	64	70
08-09	112	115	114
09-10	86	59	72
10-11	112	116	114
11-12	62	50	56
12-13	53	42	48
13-14	130	111	120
14-15	121	91	106
15-16	119	96	108
16-17	70	68	69
17-18	51	56	54
18-19	113	91	102

figures which are shown in the last column represent, with fair dependability, the rainfall during 70 years over a wide extent of territory centrally located in California. In diagrammatic form they are shown in Fig. 1.

If these percentages of normal rain be now arranged according to magnitude as shown in Fig. 2 and the curve which they represent be smoothed out, and if the frequency of occurrence be expressed in percentage, it will be found that in any large number of years the rainfall in the seasonal years will be,—

Less than 30% of the normal in	0.5 per cent of all the years
30 to 40 per cent in	3 per cent thereof
40 to 50 per cent in	3.5 per cent thereof
50 to 60 per cent in	5 per cent thereof
60 to 70 per cent in	7 per cent thereof
70 to 80 per cent in	10 per cent thereof
80 to 90 per cent in	13 per cent thereof
90 to 100 per cent in	13.5 per cent thereof
100 to 110	13
110 to 120	11
120 to 130	6
130 to 140	3.5
140 to 150	3
150 to 175	4
175 to 200 per cent or more in	3.5 per cent thereof

In Fig. 3 there is shown the normal rainfall by months averaged for San Francisco and Sacramento, again expressed in per cent of the normal seasonal rain, and there is also shown the resulting mass curve from which the normal fall of rain to any date for any place in central California can be computed when the seasonal normal of that place is known. Thus, for example, at date of writing, February 14th, the normal rain is 64 per cent of the seasonal normal. This for San Francisco is 64 per cent of 22.7 inches or 14.5 inches and for Sacramento 12.2, to be compared with 14.4 and 12.2 as carried by the Weather Bureau for the same date for these stations.

Fig. 4 has been prepared to show how the rainfall of this season 1919-20 compares with the normal. The normal at this date, again taking the two stations in combination, is 64 per cent of the seasonal normal. The actual rainfall to date has been only 20 per cent of the seasonal normal and only about 31 per cent of the amount already due in a normal year. The normal year probability for the remainder of the season is indicated in Fig. 4 by a broken line extension of the record. Will this probability be realized? Or will the dry type of season continue, with a seasonal total of perhaps only 30 per cent? Who can tell?

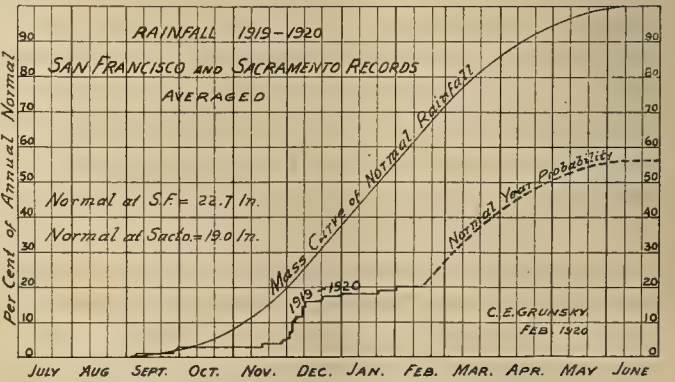


Fig. 4. Curve showing relation of the rainfall for 1919-20 to the normal rainfall, together with the remainder of the season.



## Fontana Power-Irrigation Development

BY C. H. TALLANT

(An authoritative description of the newest small hydroelectric plant in California developed as part of an important irrigation scheme. In the West are a vast number of such possible sources of power which will be developed as soon as they are justified financially.—The Editor.)

An interesting example of the development of available water power as a by-product by an irrigation company, to the mutual benefit of the irrigation company and the local power company, is furnished by the Fontana Land Company, Fontana, California. This irrigation company is operating an irrigation and reclamation project on a large scale and develops power as a by-product under conditions that are extremely interesting.

The project at Fontana was primarily planned only for supplying water for irrigation to an arid section, for the growing of oranges, the water to be taken from a comparatively restricted storage capacity and drainage area. As the plans neared completion the possibility of utilizing the power of the stored water was recognized by the officials of the company and the purchase of the necessary power developing equipment was authorized.

Due to the topography of the country and the relative locations of the storage basin and the section to be irrigated, an unusually long pipe line, 29,000 feet, was necessary. This length of line provided a static head of 725 feet between the intake and the level of the site chosen for the power house, but materially affected the effective head obtainable, on account of an extremely variable flow during seasons.

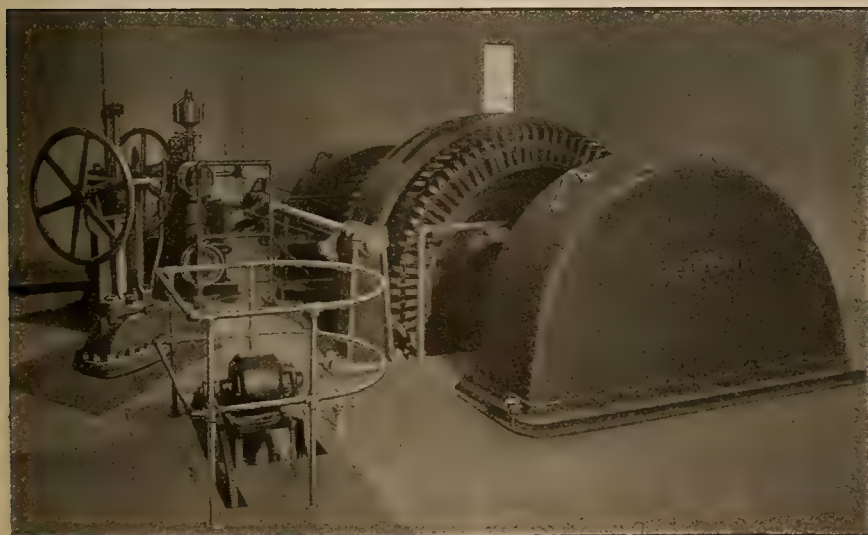
By taking all possible advantage of the limitations of the drainage area, the company is able to store sufficient water during the rainy seasons to supply the needs of the reclaimed section, but strictest economy of the stored water is necessary at all times, as a protection against dry years. This completely limits the amount of water that can be used at any time, though a certain minimum is used even during the rainy seasons.

In developing a market for the power to be generated the Land Company entered into an agreement with Southern California Edison Company to furnish the entire output to the power company at a fixed flat rate per kilowatt-hour, regardless of volume. The situation thus presented the paradox of the desirability of maximum output at all times and the opposing necessity of greatly limiting the output during the rainy season, in order to conserve water for irrigation during the dry season, when the peak flow occurred.

The situation was thus complicated by the wide variation in the amount of water to be delivered to the hydraulic units and the resultant variation in effective head. At full load, with 58-second feet flowing, the effective head is 505 feet, and at minimum load, with 10-second feet flowing, the effective head increases to 657 feet. These conditions are more than usually severe for a small plant, and require hydraulic equipment that develops the highest possible efficiency and maximum possible output at all times, irrespective of the amounts of water flowing, while simultaneously showing the greatest possible water economy.

To meet these conditions an idea in hydraulic turbine design was carried out that was found to be highly successful. Two 1350-hp. double overhung Pelton impulse turbines, connected to Westinghouse generators, make up the main units. These units show a practically flat efficiency curve over the full range from minimum load to full load and so develop a close economy of water continuously. Water flow regulation is taken care of by electrically operated needle nozzles, dependent upon the height of water in the forebay. Speed fluctuations are taken care of by governors operating deflecting nozzles, which permit the required amount of water to flow through while regulating the speed of the units.

The generators are rated at 900 kw. each, generating at 10,000 volts, normal, and are connected directly to the 10,000-volt lines of the Southern California Edison Company which pass close by. The Southern California Edison Company has a small hydroelectric plant located on Lytle Creek just above the intake of the Fontana plant, and the discharge of the former is into the forebay of the latter. It is interesting to note that the Fontana Power Company installed electrically operated pumps above the Lytle Creek plant which draw water from the bed of the stream and lift it into the Lytle Creek canal line. As the lift is less than the drop at the

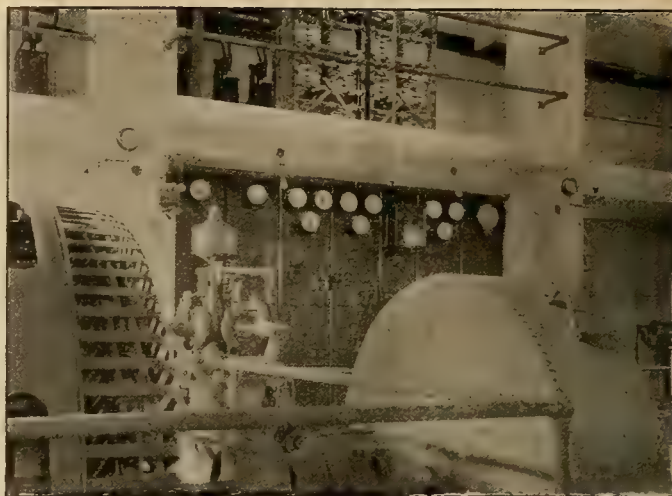


ONE OF THE TWO MAIN GENERATING UNITS OF FONTANA POWER INSTALLATION  
View shows motor in the foreground for electrically operating one needle nozzle. The wheel on the extreme left is for hand operation of the gate valve. In rear of view is the governor for operating the deflecting nozzles.





Rear view of Fontana Plant, showing arrangement of weirs for measuring the total water and later for measuring the division between different distribution lines.



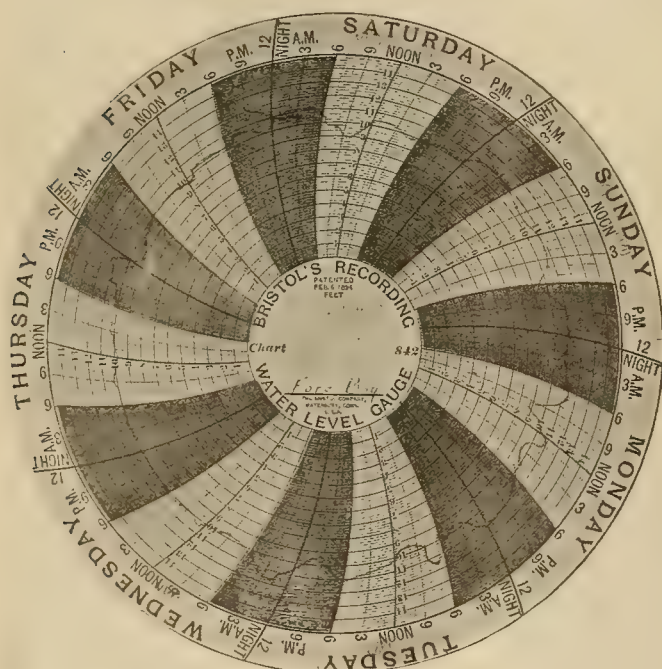
Switchboard and portion of the switch and bus gallery. All the equipment is carefully guarded to prevent accidents.

Lytle Creek plant there is a decided gain in output as well as an increase in the amount of water available for Fontana plant, and later for irrigation.

A photograph is shown of the switchboard which was designed to fit the space between two of the pillars. The switchboard equipment consists of two exciter panels, two generator panels, two line panels and one panel mounting the forebay indicating instruments. The metering layout includes ex-

irregular one, the fluctuations having been caused by intermittent showers and freezing weather above the intake. The water consumption of the turbines is measured by two weirs in series at the power house, just below the tail race. To insure extreme accuracy of weir measurement, by having smooth flow, the direction of the water is changed several times during its passage through the weir equipment.

The following tabulation of kw-hr. generated at Fontana since installation, shows the results which may be expected from such installations.



Seven-day chart recording the variation in forebay water level, showing careful attention given by plant operator.

citer ammeters, generator ammeters and wattmeters, line ammeters and totalizing indicating, recording and integrating wattmeters. A power-factor meter is also installed.

A close check is kept on the level of the water in the forebay and on the amount of water passing through the turbines. A recording water level gauge in the power house indicates the water level in the forebay continuously, one seven-day chart from which appears here. This chart happens to be a very

#### KW-HR. GENERATED AT FONTANA

Month	1917	1918	1919
January		752,000	804,000
February		652,000	632,000
March		1,282,000	738,000
April		1,451,000	833,000
May		1,266,000	754,000
June		955,000	581,000
July		1,144,000	494,000
August		1,241,000	472,000
September		1,066,000	449,000
October		1,122,000	602,000
November		901,000	533,000
December	188,000	844,000	555,000

#### THE STATUS OF THE NATURAL GAS SUPPLY

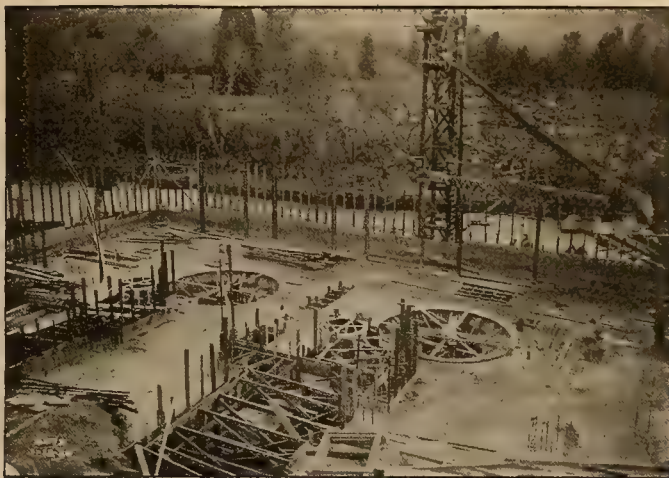
Steps are now being taken to conserve the supply of natural gas, a provision of especial interest to the electrical industry in view of the use of this fuel in California in the generation of electricity. According to a recent report by Dr. R. H. Fernald, of the University of Pennsylvania, natural gas occurs in 23 states, from New York to California and from Michigan to Louisiana. In spite of a tremendous waste which has reduced the fields of Pennsylvania, Ohio and Indiana almost to depletion, the production in 1915 amounted to 628,579,000,000 cubic feet.

Any estimate of the probable future of this supply is of course, somewhat of a guess. Wyer states that the average life of wells in Ohio is less than five years. As several of the old wells are already exhausted and as others are showing signs of exhaustion, Prof. Fernald's conclusion is that the supply cannot be counted upon for long—even though new wells are located from time to time.





Large siphon on canal line in nearly completed state

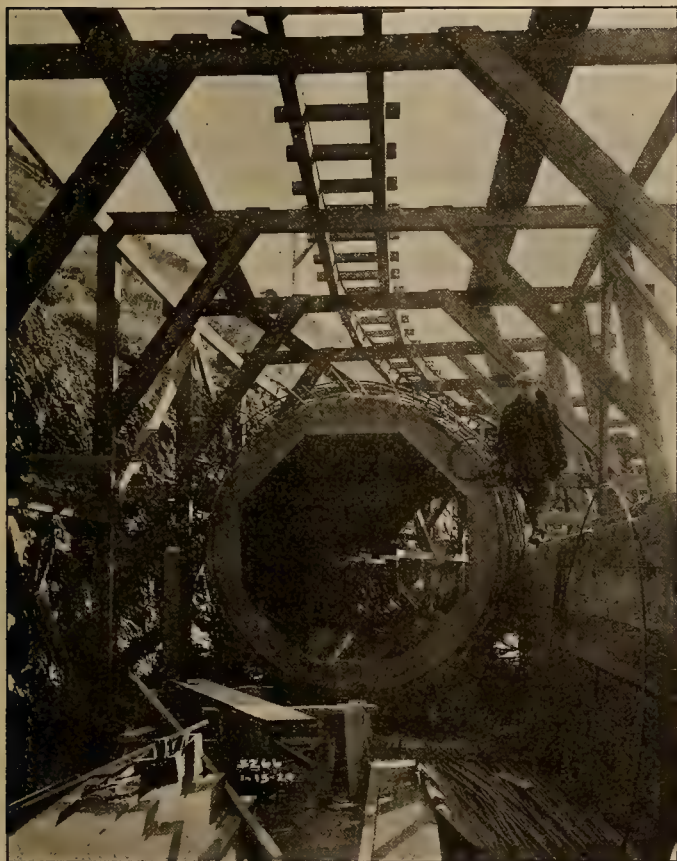


Power house floor and foundations showing forms for draft tubes in center.

## Kern River No. 3 Plant Rapidly Progressing

The Kern River No. 3 plant of the Southern California Edison Company is being rapidly pushed to completion. This is a 30,000-kw. plant having two generating units which are remarkable for two reasons: The prime movers are reaction turbines operating under 800-ft. head—the highest of that type yet attempted. The generators are designed

for speeds of 500 or 600 r.p.m., generating 50 cycles or 60 cycles; they must deliver full output in kva. at normal voltage and at 56% normal voltage. The former output at lagging power factor and the latter output of 187% normal current at 0% power factor leading. Power is to be transmitted at 75,000 volts to Vestal substation on the Big Creek lines.



H. W. Dennis, construction engineer, Southern California Edison Company, standing on forms used for concrete canal.



Activity at headworks. There is only a very short length of open ditch. Photographs by G. Haven Bishop.



## Room at the Top

BY S. M. KENNEDY

(What are the qualifications that make for advancement? The general agent of the Southern California Edison Company here analyzes some of the characteristics for which there is always "room at the top" and points out that the application of qualities is more often the determining factor than the mere possession of them. This is the ninth article of Mr. Kennedy's series.—The Editor.)

In almost every public utility organization of any size that is attempting to keep pace with its responsibilities, there is a constant demand for a certain class of men. Men there are in plenty who may be termed "average." Men there are in abundance who are known to be "below the average," but of men who are able to lift their heads above the average in any line of work there is always a scarcity. This condition may be accounted for by the careful use of three tests, namely: lack of ability, lack of ambition and lack of application. The first named test, lack of ability, has the least to do with the scarcity of high grade men. Almost every man has ability along at least one line. If he is engaged in some occupation at which he does not make progress or for which he has no liking, he is probably in the wrong place. It would be much better for him to look around for some work more adapted to his tastes and qualifications. Usually he can find something that will hold a future for him, if he is not afraid of work. The second class, lack of ambition, is a more difficult one to handle. Lack of ambition may be the result of poor health, the absence of a necessity for working in order to exist, or lack of a full share of life's responsibilities—or pure laziness. One thing is certain, men without ambition are almost useless, and if the necessary stimulation cannot be pumped into them by some means, they are heading for the discard. The third class, lack of application, is the one which contains the greatest number, and which holds the greatest possibilities—if only those belonging to it can be brought to see the light. After all is said and done, it is work and only work that wins—provided the work is along the right lines. The epigram of Thomas A. Edison that "Genius is partly inspiration but mostly perspiration," is worth calling attention to. It is true it hardly needs elucidation, and yet as preachers sometimes amplify good texts into poor sermons, maybe a halting word or two may be said about its definition. Genius is indeed God-given, but nobody knows what may be accomplished by hard work. Oftentimes it takes work to bring out genius. The man who wants anything must put a firm hand on the plow and he may be assured that even if he does not get what he wants, he will get something worth having. No honest work in this world is ever unrewarded. With a real worker, time is measured only by what is accomplished, whereas with the man who lacks ambition or application, the clock only is the measure of his labor.

"One sadly sees the setting sun  
And views his day's work with a sigh,  
The other drops his tools to run  
Nor cares how little he has done;  
And people still go asking why  
Some men are down and some are high."

Some men are always going to get busy and do things worth while—but while their intentions may be good, their accomplishments are nil, because of constant procrastination. Such men should get busy or stop talking. Others there are who put in their time wishing for one thing and another, which if they had, they think would put them in a position to do great things. There is a vast difference between wishing and winning. Many a good man has failed because he had his wishbone where his backbone ought to be.

There is another class of men, who hold back and fail to get results for fear they may make mistakes or do something wrong. The best of men will make mistakes occasionally—that is only human. If a man wants to avoid error, he has his choice of two things—either do nothing or die.

There is still another class of men who accomplish nothing because they are awaiting what they term "their opportunity." They feel that they have the necessary ability to do big things if only the opportunity would come. It is safe to say that opportunities are lying all around such men, just waiting to be grasped. But these chances are passed by because they don't appear big enough; are overlooked because they mean starting too small; and are trampled under foot because future prospects seem too remote. And all the time these daily opportunities to which such men are blinded, lead to big things and high places. "One ship goes east, another west, by the self-same winds that blow, 'tis the set of the sail and not the gale that determines the way they go."

If there is room at the top for all engaged in the public utility business, including engineers, accountants, operators and commercial men, then what are the essentials in order to fill a space in that room? It is not possible to indicate all the elements that go to make up a successful career, but some of the high spots may here be touched upon.

### Persistence

With most men the degree of their laziness or their industry depends partly upon their affinity for the work, but chiefly upon the motives which stimulate them. With some men the motive is to obtain a livelihood, with others it is ambition, and in many cases a combination of the two. In any event, the room at the top is never reached by lagging behind in the daily race, and watching others go by. A recent issue of a New York paper contained a fable of four men, which was as follows: "I got off a street car the other morning," said a doctor, "and, being in no hurry, I began moralizing on the probable characters of the three men who had alighted ahead of me. The first one was even then half way down the block and was going on with such rapid strides that he had already put a couple of hundred yards



between himself and the next man. 'There,' thought I, 'goes a hustler,—a man who's bound to succeed in life.' The second man was walking rather slower, and impressed me as one who would do fairly well, perhaps, in the world. But the last fellow was just dawdling along in a most shiftless sort of a way. I very quickly set him down as a loafer. Just then the idea came home to me: 'All three men were ahead of me.'"

The man who seeks promotion must keep at his work whether his superior is looking or not. In a large corporation, although he may not think it, an employe is under observation at all times, and his work carefully noted. The slacker is soon known to be a slacker, and the diligent worker does not go undiscovered. When higher positions are to be filled and promotions made sometimes the slacker wonders why he was overlooked, and his neighbor selected. If he wants the truth let him ask his chief. A man who wants to fill a big position had best begin by overfilling a smaller one. That means work, intelligent work and constant work. Work with the incentive of ambition for something to be attained ahead, and work with the incentive of duty to be done close at hand. A man should not be content with doing only his duty. He should do more than his duty. It is the horse that finishes a neck ahead that wins the race. A man should only stop when he has done his best, for that is the greatest thing he can possibly do.

#### Cheerfulness

No man ever reached the room at the top because he was grouchy or despondent. There may be instances where such men have attained high positions, but it has been because of marked ability along some particular lines and in spite of their dispositions. Cheerfulness sharpens the edge and removes the rust from the mind. Every man should learn to laugh. A good story is better than medicine and is much easier to take and give. A well-told story is as welcome as a sunbeam in a sick room. The other fellow wants cheerfulness, and is dodging troubles. Every man should keep his troubles to himself. The world is too busy to care for his ills and sorrows. Let him learn to stop croaking. If he cannot see any good around him, let him keep the bad to himself. Other people have troubles worse than his—there may be some comfort in that. Out in the world no one cares to hear whether someone else has an ear-ache, toothache, or headache. Some men will even weep when telling of their pains and troubles. Tears do well enough in novels, but they are out of place in real life. At times they cannot be prevented, and may even be necessary—but not in public, if avoidable. A man should meet his friends with a smile—the good-humored is always welcome, but the ill-tempered or hypochondriac is usually a nuisance and not wanted anywhere. The twin brother to cheerfulness is enthusiasm. If a man is enthusiastic, he cannot long be doleful or discouraged. It is a powerful element in success and is a useful factor in reaching the room at the top. An imaginative writer has said about enthusiasm that it "breakfasts on obsta-

cles, lunches on objections, dines on competitors and rests in peaceful slumber on their scattered tail feathers."

#### Soundness

The great prizes of life do not fall to the most brilliant, to the cleverest, to the shrewdest or to the best educated, but to the most level-headed men, to the men of soundest judgment. In a public utility organization, when a man is wanted for a responsible position, his shrewdness is not considered so important as the quality of his judgment. Reliability is what is wanted—will he do the right thing in an emergency? It is not an unusual thing to see men who are very brilliant but out of work, and plenty of sharp men who wonder why they do not get responsible positions. The reason is that people are afraid of one-sided, poorly-balanced men. They are not considered safe, but are to be avoided. A man may be smart, sharp, shrewd and clever, and may be a good scholar, even a brilliant one, but is he sound? That is the question an executive considering him for a responsible position will ask. Is he substantial? Is he solid? Has he a level head? What the chiefs of large organizations want are men that are safe. A great railroad corporation operating in the West once printed a set of rules governing the actions of its men under all conceivable circumstances, so that it might have been expected no emergency could arise which would not be covered by one of the rules. But at the bottom of the list of instructions, printed in type a little larger than the rest, were these words: "In cases of doubt, always take the safe side." That is what is wanted of the men who are to reach the room at the top—above all things—safety. People want to feel that a man in a responsible position can keep a clear brain and a level head, no matter what comes; that he cannot be shaken from his center, no matter what trouble may arise or how much influence may be brought to bear upon him. They want to feel sure he is sound to the core. Many people are liable to overestimate the value of education, of brilliance and of keenness, which they think at times may be substituted for a level head and sound judgment. If men in a public utility organization are to rise they must first be tested, and the testing process is going on all the time. Some men resemble the Arizona mustang—they will go on along right and safe lines for months, yes, maybe years at a time, and then some day for no accountable reason will go off at a tangent and do the wrong thing at a critical moment. That is what must be avoided. Reliability is what is wanted. Can a man stand without being tripped; and if he is thrown can he land on his feet? Can he be depended upon, under all circumstances, to do the sensible thing? Has he good horse sense? Is he liable to go off half-cocked? Does he lose his temper or can he control himself? If he can keep a level head under all circumstances, if he cannot be thrown off his balance, and is honest, then he is the man that is wanted. The younger men, looking up at the room at the top, will do well to place the proper value on soundness to learn its import and cultivate it on all occasions and under all circumstances. There can



be no permanent advancement, especially near the top, unless the applicant be sound to the core.

### Loyalty

When a man belongs to an organization, it goes without saying that he will be loyal to its interests. If he cannot be, he should sever his connection immediately, or lose the respect of his fellows. But a man may be loyal to his company and yet possibly disloyal to himself. All men should desire to advance, but this does not mean the acceptance of every will-o-the-wisp offer dangled before his eyes. The man who is offered a bigger salary elsewhere and refuses it to stay at his present job is actuated by other than mere money considerations. Permanency of position, congenial work and co-workers, efficient supervision, benefit funds, pensions or service annuities, assurance of promotion—these are some of the factors that are included in a man's wages that cannot be expressed in cash terms, yet stimulate him to effort and increase his hopes. The pay envelope contains only one of several returns for labor that keep a man loyal to his employer and his work. Many a good man has left the organization in which he was comfortable, and in which he had an assured future, to go into some enterprise without proven stability, just because he was offered a few more dollars per month. Dollars are useful and absolutely necessary, but there are other considerations which should not be even temporarily overlooked. Many a man who yielded to the temptation and left his organization has later been glad to return and accept a lesser salary than he had before, and in addition, lose his seniority and original chances for advancement. With loyalty there should go a love of the work in which a man may be engaged. He must love it to have its best interests at heart. He must love it to bring out his own best qualities, so that his work will put him in line to occupy the room at the top.

"Are you trying to climb where the chosen are,  
Where the feet of men are few?  
Do you long for a job that is worth one's while?  
Well, here's a thought for you:  
The pots of gold at the rainbow's end,  
Are sought by the teeming mob,  
But the fairies who guard them choose as a friend  
The man who loves his job."



A SPECIAL FIXTURE ROOM

The difficulties involved in suitably displaying electric fixtures are overcome by setting aside a special room for fixtures only. That shown above is at the enterprising Cox Electric Store in Monterey, California.

## Western Ideas

A BEACON LIGHT which calls attention to the store and at the same time to the fact that mazda lamps are obtainable there, is effectively used by the Lewis Electric Company of Fresno, California, of which H. W. Lewis is proprietor. This is a most attractive store, both inside and out, especial attention being given to such details as the glass paneling at the rear of the windows and to linen curtains which finish the windows at the top. An attractive wicker bird cage gives a distinctive touch to the



Some distinctive touch on the store front, such as the beacon light used here will always call special attention to the establishment

interior, while a stained glass finish to the store front above the window space shows up particularly well at night. The center of this feature is a medallion which shows a lighthouse upon the rocks. A portable lamp is arranged just behind this so that the light shines out from the clear glass at the lighthouse tower most realistically at night.

THE SATISFIED CUSTOMER is the best of advertisements for such electrical appliances as the electric washing machine, and with the idea in mind the wide-awake electrical salesman will take the promising customer into partnership. A woman who is likely to be willing to make a little money on the side and who is in a position to talk to her neighbors on the virtues of her new washing machine, can be approached with a commission offer. The salesman can state that he or she makes \$10 (it may actually be \$15) on every washing machine sold, and that if Mrs. Jones can sell any for him, he will be glad to divide up this commission, allowing Mrs. Jones \$5 for her work. If Mrs. Jones is willing, he leaves a half-dozen post cards, already addressed, on which Mrs. Jones is to give the name and address of such women as she has the opportunity to demonstrating her machine to in her own home and who have stated that they would be interested in purchasing such a machine. Of course, this lessens the commission received, but it entails no expense—and if orders actually are received in this way, it is just so much velvet. It is possible to have fifteen such auxiliary salesmen working for you in all parts of the city, at no cost to yourself, other than that of the commission itself paid when the order is received.

The firm, of course, is aware that such payments are made, but takes no official recognition of it, so







## At the Sign of the Green Candle

(There are stores and stores: some of them make shopping an unpleasant necessity, some are neutral, and a few, like the charming establishment described below, are a species of art gallery, tempting the customer to linger indefinitely, and proving that there is no limit to the artistic possibilities of the electrical store.—The Editor.)

The customer who does his electrical shopping "At the Sign of the Green Candle" in Erie, Pa., encounters something altogether unique in the way of stores. The white doorway of the Rusterholtz Electric Company is distinguished by a pair of brackets, which are lighted at dusk, and by a large electric sign displaying an old-fashioned candlestick with the slogan "At the Sign of the Green Candle."

At the head of the stairs one enters a hall twenty-five feet long and seven feet wide. This is the real entrance to the store and is treated in a striking manner. The hallway represents the exterior of a colonial home with massive white doorway and white stucco walls. Opposite the doorway the wall has been painted to present the appearance of a colonial garden beyond a garden wall.

Opening the big glass doors the customer steps into a hallway which runs the entire length of the show room, and on one side of which are the various studios for the display of fixtures. The walls of the hallway are done in a dark brown, the little windows and the glass door are attractively decorated with net curtains and blue silk overdrapes. Hall fixtures and commercial units are displayed on the ceiling while washing machines, vacuum cleaners, and appliances take up the floor space. A rack is located at one side of the hall where is displayed an assortment of electric shades. Table lamps and floor lamps are displayed here and there through all the studios.

At the front of the store is a large room eighteen by twenty-five feet, where are displayed the better grade of fixtures. The walls here have a dark tare covering with all the richness of velour, enhanced by the ivory paneling. A large brick fireplace adds much to the beauty of the room. The windows have dark terra cotta shades, ecru curtains and blue velour overdrapes. The rug is plain tone and taupe in color. The furniture is mahogany.

Next to the front door is a small studio nine by eleven feet with blue wall coverings, where are displayed a large variety of silver dining room pieces.

A beveled plate glass mirrored door with tan silk drape, furniture in French gray, and a rug of plain mouse color, make up a harmonious whole.

Next to this small studio, and directly opposite the main entrance, is a larger one with walls done in a deep brown, and a rug of taupe color. A tapestry brick fireplace and reed furniture in frosted brown finish help to set this room off to good advantage. The fixtures displayed here are suitable for living rooms, dens and libraries.

Adjacent to this studio is a small room nine by eleven feet treated in light gray, and displaying a variety of fixtures suitable for bed rooms and halls. The furniture is ivory and the rug a plain mouse shade, while a beveled plate mirrored door with art drapes adds a bit of color that is particularly pleasing.

Immediately behind this room are three studios each eleven by fifteen feet in size. The first has deep bronze color wall covering in a leather effect, a beveled plate mirrored window with black and gold brocade draperies, mahogany furniture and a mouse color rug. The fixtures displayed in this room are all in polychrome effects.

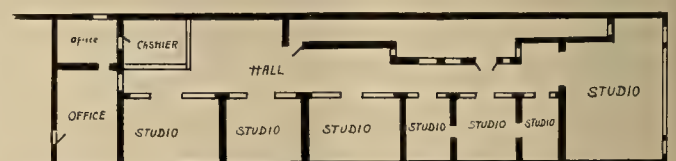
The second of these studios is done in a light brown tiffany wall covering. A beveled mirrored window with changeable

blue and tan draperies, mahogany furniture and a mouse color rug complete the furnishing, and the fixtures displayed are in the darker finishes, like jap gold, jap bronze, barbadino, etc.



AN UNUSUAL ENTRANCE

Not the entrance to a colonial home, but to an up-to-date electrical store which considers an artistic setting an integral part of successful high-class merchandising.



Floor plan of the display department, showing the arrangement of the studios, hall and offices.

The last studio has a green leather effect wall covering, with black and old gold window draperies, and mahogany furniture. The fixtures displayed in



this room are an assortment of bowls and showers of the cheaper type.

Immediately behind the display room are two offices for the members of the firm, and behind that



AN ARTISTIC DISPLAY ROOM

Rich dark wall-covering set off by ivory paneling, window drapes of dark terra cotta and blue velour, shining mahogany furniture—a background such as this shows the customer, far more convincingly than words can do, just how his electrical fixtures can look in his home.

a three-story factory and warehouse. The basement is given over to storage, the ground floor to automobiles, packing, receiving and shipping; the second floor to stock of materials for house wiring, and the third floor to storage of glassware and fixture parts and the manufacture of fixtures. All told, the company is using 7,500 feet of floor space and can double that amount by taking over the balance of the building.

The store, which is on the main street and in the heart of the business district, has only recently been opened. To celebrate the event the company held a reception to invited guests of the Board of Commerce, Commercial Club, Kiwanus Club, Rotary Club, Builders' Exchange and Real Estate Board. Refreshments were served and a jazz orchestra helped to liven the evening. The display room was crowded with visitors from seven until eleven in the evening.

The business was organized in 1912 by Harper G. Rusterholtz, who conducted it alone until 1917, when Gurth Baldwin was admitted to the firm. All the planning was done by the members of the firm, and the pleasing results can be credited entirely to them.



THE MAIN HALLWAY

This attractive vista gives an idea of how un-store-like an electrical store may be made. The many-colored fixtures which invite the customer to leisurely inspection, are set off by a background of dark brown walls and blue draperies.







sible to determine whether due foresight has been observed by the worker on the job in securing all his materials at one time. If three records during the morning appear on the job summary sheet for material, the need of which should have been foreseen, it is possible to look to the labor summary and see who was on the job for that period and check up the cause.

A delivery record is also kept in triplicate, which bears the job number and requisition number. The two upper slips go with the material. The yellow copy comes back to the store room after being receipted by the person responsible for the order. The white copy remains with him. This makes it possible to trace material without break from the time of its ordering to delivery.

A credit slip made out in duplicate similar to the requisition blanks is used for all materials returned after a job is complete. This also bears the job number and is filed in the job envelope after recording on the job summary sheet. This is evidence always that the job is closed and from this record and those previously on hand, totals are reckoned and costs figured. No job is complete without this slip, as there should always be something to return to the store room.

## Keep Time Records —

In addition to this complete record of material used, a daily time record is kept of each man who works on the job. This provides for a record of the man's work during the entire day, with the number of the job in question each time, the name of the job, a description of the work done and the length of time involved. This record is entered each day not only on the individual accounts of the men themselves, but on the job summary sheets in the space left for a labor summary. The complete information given furnishes the basis for later estimates on similar jobs. Thus it is possible to tell just how long was taken in pulling a given length of wire, and what will be a probable labor cost on a similar piece of work for which a bid must be entered.

### The Summary —

The Job Summary Sheet is the recapitulation of all this information. On the front of the sheet

is provided space for the recording of all material used on the job. Conduit, wire, boxes and the more general types of materials used are printed on the form and ample space is left for other details. This information includes requisition numbers, date and quantity of material. Each requisition for material is recorded separately. Space is left at the end for the material returned and total columns for the total material used of each type, the total charge, unit costs and total costs. This last column of costs is placed at the extreme right of the page, so arranged that the costs recorded on the back of the form occur directly opposite. In case any use should be made of the sheet in which it would be desirable not to have this cost information appear, this column could thus be cut from the sheet without injuring the record otherwise.

On the back appears a similar record of material purchased for the job—such items as were not obtainable from the regular stores on hand. Sundry charges are listed below, such things as the contractor is too apt to figure in as the general overhead of his business, but which are strictly chargeable to the individual job. These include such items as telephone expense, auto mileage, express, board and lodging, inspection, etc.

Labor is listed twice, once under the date, showing who worked on the job each day and for what length of time, and the other under the individuals who did the work, showing the total number of hours they put in. This is particularly valuable in estimating labor costs on future jobs—and also in keeping track of the work which each man is doing.

At the foot of the page is a summary of this information, material from stock, material purchased, sundry charges and labor expense. This is figured in both costs and charges, so that the totals of these two columns when complete present a picture of the entire job and the profit made.

Upon receipt of the money, the transaction is regarded as closed and all data connected with the case is filed in the job envelope, which is made so that when the folded summary sheet is inserted, the name and address of the job and the job number may readily be seen without opening the envelope.

[illegible]

The job summary sheet which contains a recapitulation of all the data on the material, costs, etc., entered on the various slips made out while the job is under way.



# Office Records—Their Filing and Indexing

BY IRENE WARREN

(Your files should be time-savers, but if they are unsystematic or untidy they will be time-wasters. Some businesses need only a very simple filing system while others require a more complex and minute one, according to the type and amount of material handled. The following article, the fourth of a series by the Director of the Chicago School of Filing and Indexing, will help you to select the system best suited to your needs.—The Editor.)

## ALPHABETIC-NUMBERED SYSTEMS

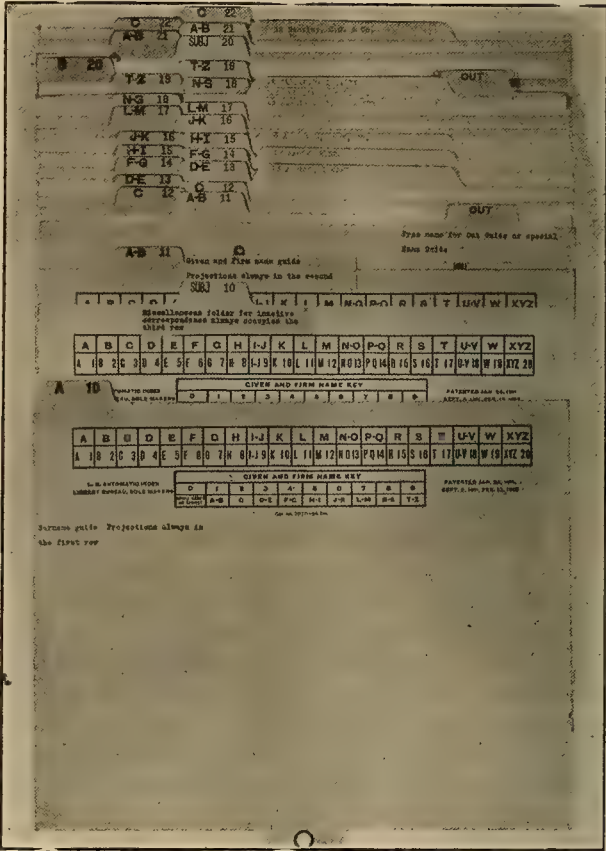
Every firm selling systems has manufactured a single coded alphabetic arrangement. These go under various trade names such as the Safeguard, and Direct Name System.

They differ from the Alphabetic Plain systems described in the preceding article, in that they have consecutive numbers attached to the standard divisions of the alphabet as shown in the following chart:

SINGLE CODE, ALPHABETIC-NUMBERED, 60 DIVISIONS OF ALPHABET					
A-C	D-G	H-K	L-N	O-S	T-Z
A 1	D 11	H 21	L 31	O 41	T 52
Am 2	De 12	Har 22	Li 32	P 42	Ti 53
	Do 13	He 23		Pi 43	U 54
B 3		Ho 24	M 33		
Be 4	E 14	Hu 25	Mc 34		
Bi 5	En 15		Me 35	Q 44	V 55
Br 6		I 26	Mi 36		
Bu 7	F 16		Mo 37	R 45	Wa 56
	Fo 17	J 27	Mu 38	Ri 46	We 57
C 8		Jo 28		Ro 47	Wi 58
Ch 9	G 18		N 39		Wr 59
Co 10	Gi 19	K 29	No 40	S 48	
	Gr 20	Ki 30		Sch 49	X-Y-Z 60
				Sm 50	
				Sp 51	

These numbers are used for two purposes only: for speed in sorting and as checks against misfiling. The numbers are printed in front of the standard

divisions of the alphabet on the tabs of both the guides and the miscellaneous correspondence folders. The file clerk places the numbers on the label of the regular correspondent's folder before the name. The name under which the letter is filed is the one that is coded. The following are properly written and coded



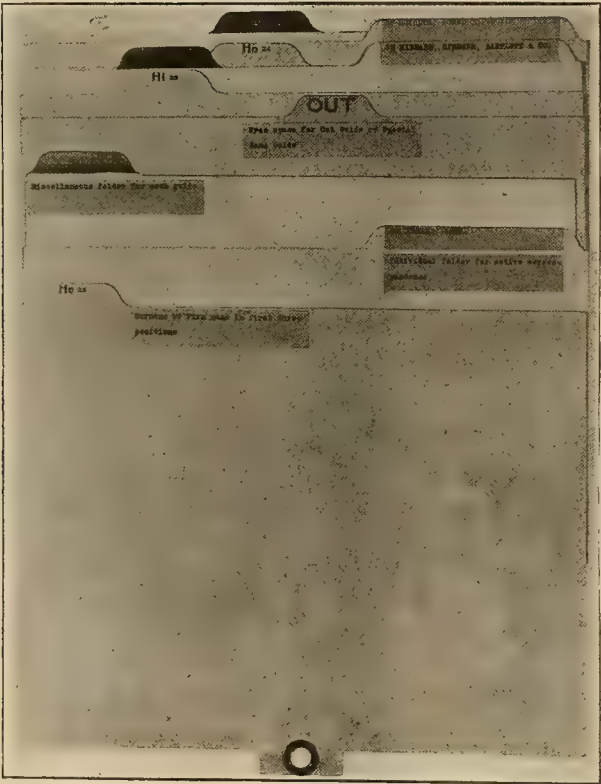
The alphabetic double code systems, the most highly developed of which is the Automatic, involve primary and secondary keys consisting of two alphabetic numbered charts. Its principal advantage is that it provides a more even distribution of miscellaneous correspondence than does any other system.

as they should be on the label of the regular correspondent's folder:

- 6 Brown, J. C.
- 8 Carson, Pirie, Scott & Co.
- 33 MacDowell, L. M.
- 39 National Biscuit Co.

In assigning the number, if the name falls between two alphabetic combinations on the chart, always take the combination above. Place the proper code number in the upper right hand corner of the letter.

The method used in marking the letters, sorting them and filing them away, is of the greatest importance. One file clerk in a large corporation reduced her staff a third after carefully studying methods by which she could gain the greatest accuracy and speed in getting the letters into the files. The method that usually works to the best advantage is to have the



The alphabetic single code system illustrated here is a slight elaboration of the alphabetic plain systems, the numbers being used for speed in sorting and as checks against misfiling.



supervisor or one or two of the best assistants mark the letters for filing by underscoring the name under which the letter is to be filed, placing a cross (X) under names or words for which cross reference sheets are to be made, and encircling the important

Some designers of filing systems think that such systems as the Safe-Guard are too mechanically set up and have unnecessary guides and miscellaneous tab folders. They prefer starting with the minimum number of primary guides which they place in the first position and add other guides as the need arises. The illustration of the Macey System shows this plan. A guide is inserted in the second position which represents the second letter in the name to be filed, and where a division is large, another guide is inserted in the third position for the third letter in the word. But the busy file clerks usually prefer a system completely set up which will permit of considerable expansion, and the distance between the guides representing the first, second and third letters of the word being filed is so great in this plan that often the file clerk cannot get the combination quickly. No numbers are used in connection with such a scheme.

### Automatic System

A new idea in filing is to use a double coding system with primary and secondary keys consisting of two alphabetic numbered charts. The most highly developed of these systems is the Automatic. The primary key consists of standard divisions of the alphabet planned for various size collections, ranging from ten divisions to more than 250, and these are numbered in tens. The secondary key consists of ten divisions of the alphabet, which remain the same for all primary divisions. The complete lettering and numbering for each division is placed on the subordinate or secondary guide which is in the second position. There is a miscellaneous tab folder for each of the secondary guides. The numbers and names are placed on the regular correspondent's folders in the same style as was described in the single coded system. The surname of an individual or the first name in the firm is coded from the primary key. The given name or initials, or the second name in the firm, are coded by the secondary key. Only two names are coded. Letters are sorted by numbers and under numbers arranged in strict alphabetic sequence. The following sections of the primary key for the 20 divisions of the alphabet, and the complete secondary key, will give an idea of the system. The names following this key are properly numbered and coded.

### Automatic — Double Code — Alphabetic-Numbered System — 20 Divisions of Alphabet

#### Primary Key:

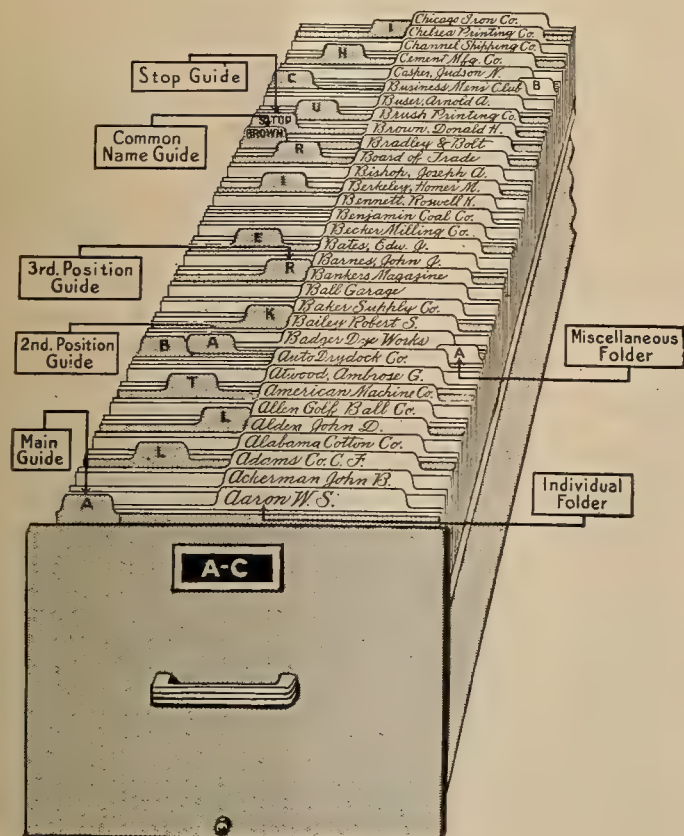
A 1, B 2, C 3, D 4, E 5, F 6, G 7, etc.

#### Secondary Key:

	0	1	2	3	4	5	6	7	8	9
Given and Firm Name Key										
Single Names A-B C		D-E	F-G	H-I	J-K	L-M	N-S	T-Z		
or Subject										

The following names are properly coded according to this scheme:

Alcohol	1		0	-10
American	1	Association	1	of Public Accountants
Aaron	1	Huber	5	-15
Amelia	1	Relief	8	Society
American	1	Pencil	8	Co.
Americana	1	Society	8	-18
Bentley	2	C.	2	O.
				-22



File arranged according to the Macey Perpetual System

word or words in the main portion of the letter so that they may be read at a glance when needed for reference later. The letters are next sorted, by less experienced help, according to the twenty-six letters of the alphabet. Then clerks code them according to the chart and again sort them by numbers which brings a close alphabetic arrangement.

### System and Neatness

Too much cannot be said about keeping neat-looking files. Every letter should be placed in the folder so that the heading is at the left end of the folder. If the nature of the business permits the clerk to pin the carbon answer with its uniform size paper on top of the incoming letter, it will make a much neater looking file. This arrangement also helps the file clerk to locate the letters more readily where each department writes its answers on a certain color of paper, thus roughly classifying them. Paper pins should never be used on letters. Irregular size papers that go in the file, such as telegrams and postals, should be distributed in the folders so as not to crowd the file in any one part. If there are a great many of them, it may be better to separate them from the correspondence and file them directly back of each correspondent's folder.

The mail received on a given day should be filed on the same day. If the work falls behind, letters should at least be kept sorted so that they may be more readily located when needed.



The Automatic System is constructed on simple lines and is most completely guided. The buyer must purchase the complete system and it is often difficult to get the business man to buy enough guides and folders in other systems so that his letters may be filed accurately and speedily. Naturally it takes longer to code the letters when using two keys even if one of the keys has only ten divisions. Puzzling questions do arise as to what to code in such titles as:

Grand	Rapids	Furniture	Co.
St.	Regis	Apartments	
Von	Bremer,	Charles	

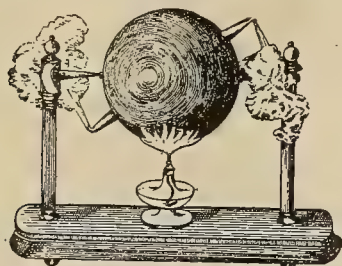
And there are differences of opinion on this point among the best clerks operating this system. Sometimes the borrower has forgotten the given name of the correspondent and it is then necessary to look through the various subdivisions until the clerk chances on the right name. One unfamiliar with this system cannot go directly to the files and get the papers he wants, as is possible in the single coded or alphabetic plain systems. A distinct advantage in this system is that a more even distribution of miscellaneous correspondence is provided for than in any other system.

## The Steam Turbine

BY WILLIS T. BATCHELLER

(The steam turbine has been brought to so high a stage of development during the last ten or fifteen years, and its use in electric power generation has become so universal, that a knowledge of its underlying principles is indispensable to anyone connected with steam engineering. The following article is the first of a series on the subject of the steam turbine. The author is electrical engineer with the Seattle Lighting Department.—The Editor.)

The prejudice against the steam turbine which existed at the time it was first becoming a commercial success, in competition with the reciprocating steam engine, has disappeared. Even in the smaller capacities where the steam consumption of the recip-



The ancient steam turbine described by Hero of Alexandria over 100 years B. C.

rocating engine is less, the turbine is frequently selected on account of its simplicity, reliability, and the ease with which it can be directly connected to the apparatus which it is to drive.

### Primitive Designs —

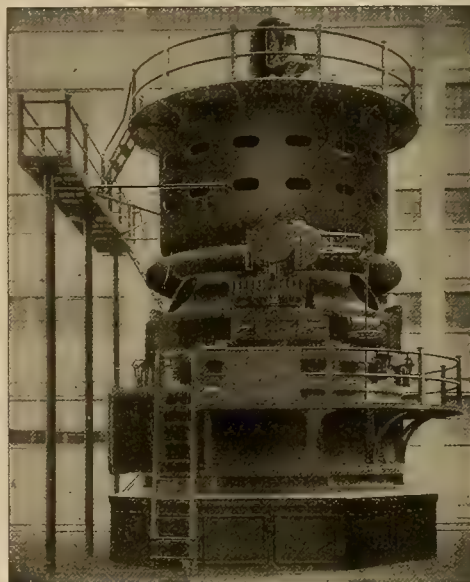
The steam turbine is not only one of the most recent developments, but is at the same time perhaps one of the most ancient forms of prime mover. In a book written by Hero of Alexandria, over 100 years before the beginning of the Christian era, a very simple form of steam turbine is described. It consisted of a hollow sphere mounted on hollow trunnions, through which the steam passed into the sphere. On opposite sides of the sphere were outlets consisting of pipes bent at right angles in lines tangent to the equator of the sphere, in such a manner that the reaction of the steam escaping through these pipes caused the sphere to revolve on its trunnions in much the same way that water escaping from the arms of a lawn sprinkler causes it to revolve. This turbine is the simplest form of pure reaction turbine.

In 1629 Branca, an Italian, invented a turbine much like a miniature water wheel, which was driven by a jet of steam from a nozzle directed against the buckets of the wheel. This is the simplest form of impulse turbine.

In 1784 Wolfgang de Kempelen designed a turbine of the lawn sprinkler type, similar in principle to Hero's engine, the chief difference being the substitution of a horizontal revolving tube for the hollow sphere which Hero used. Steam escaping from outlets in opposite ends of the tube caused it to revolve by reaction.

### The First Commercial Success —

In 1831, Avery and Foster took out the first patent granted for a turbine by the United States Patent Office. This was on the Hero lines and was really an improvement on the Wolfgang de Kempelen turbine of 1784. This turbine appears to be the first to attain commercial success. Several were built under the Avery patent and were used to run saw-mills near Syracuse, New York. Steam entered a hollow shaft through a stuffing box, passed through to the hollow arms and escaped through plain openings in opposite ends of the arms. The speed of



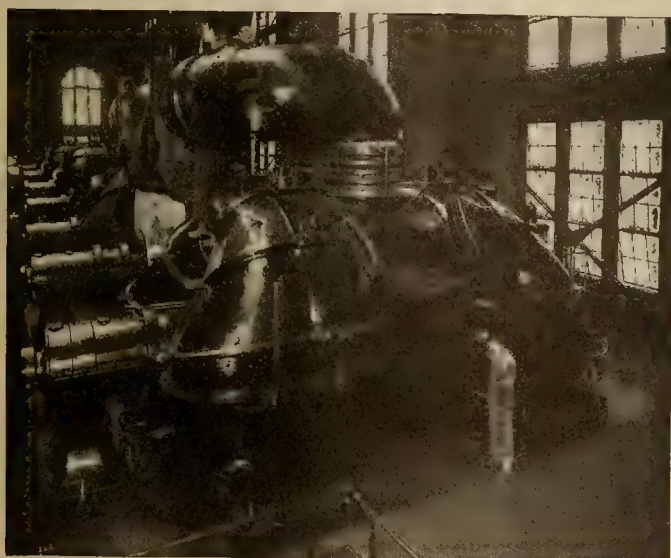
The original steam turbine manufactured by the General Electric Company. This turbine was in use some time, but when rapid development made the design obsolete it was removed to the company's yard, where it remains as a curiosity.



rotation was enormous, the periphery of a seven-foot wheel traveling at the rate of fourteen miles per minute. The wear was excessive and this, combined with inability to get proper packing for the stuffing boxes, doubtless caused its failure, for the reciprocating engine of those days had not reached its highest state of economy. Had Avery used the present expanding nozzles instead of plain openings for his steam outlets, his steam consumption would doubtless have been less but the speed of rotation more. Diverging nozzles were used as early as 1838, but as they were not correctly proportioned they were a hindrance rather than a help, and the idea seems to have been given up for a time.

#### Later Developments —

As early as 1827, a compound turbine was patented by Real & Pichon, the idea being to reduce the velocity of rotation by passing the steam through



The largest turbine in the world—a 70,000-kw. triple compound turbine manufactured by the Westinghouse Electric & Manufacturing Company, and in service at one of the power houses of the Interboro Rapid Transit Company, New York.

successive wheels separated by disks containing outlets to permit the passage of the steam from one chamber to another. This is the principle on which the present Rateau turbine works.

In 1840 Wilson patented the forerunner of the Parsons type of turbine. He passed steam successively through rows of running and stationary vanes, gradually expanding it until the exhaust pressure was reached. Wilson appears to have been among the first to realize that the volume of steam increases as it expands to lower pressures, to provide for the same by increased size of passages, and, what is perhaps most important, to claim this in his patent.

In 1858 Hartman Bros. patented a turbine consisting of two revolving disks fixed to a shaft. Between them was a segment of stationary reversing blades. This turbine embodied the essential element of the one stage Curtis turbine of the present day.

De Laval took out a patent on a reaction turbine of the Hero type in 1883. It differed from the Avery turbine in detail but not in principle. This turbine was extensively used for running cream separators,

and was commercially successful, but was later abandoned for the present type of De Laval motor.

In 1885, Parsons took out his first turbine patent on a motor along the lines previously suggested by Wilson, and is responsible for the successful development of this type of motor.

His first turbine took steam in the center and exhausted at both ends through exhaust passage, thus avoiding any end thrust. At the same time he patented his famous flexible bearing now in general use. In 1888 he patented the present arrangement of grouping several rows of blades together, increasing the drum diameters step by step to provide for proper expansion, at the same time patenting his balancing pistons, at present employed to relieve end thrust.

#### Application of the Expanding Nozzle —

The expanding nozzle had been patented in 1867 for use in steam injectors, but it was not until 1894 that anyone patented its use in connection with a turbine. In this year De Laval secured this patent and used the nozzle in connection with his turbine, for the purpose of expanding steam and getting a high velocity of jet with increased kinetic energy.

During 1894 and 1895 there were issued a large number of patents, many of which have been successfully developed. Among them were Parsons'; Rateau's, and the first patents for the use of buckets of the Pelton type.

In 1896, Curtis patented the use of an expanding nozzle in connection with a compound wheel of the type suggested by Hartman patents in 1858. Others had used both the expanding nozzle and the same type of wheel, and only two years earlier patents were taken out for a converging nozzle with a similar wheel. From a study of nozzles it will appear that the converging nozzles could be used economically by increasing the number of stages used in the expansion, but the turbine would be larger than the Curtis and probably less efficient.

This brief summary will show that the commercial success of the turbine has been due to a more complete knowledge of the properties of steam, improved details, and the possibility of better workmanship, rather than to the development of new principles, for the distinctive fundamental ideas of all of our commercial turbines had been suggested years ago.

#### GAUGE PRESSURE ON AN OIL PUMP

In determining upon the right and proper gauge pressure to carry on an oil pump that is pumping crude oil, the common for fuel, to feed through an oil burner to a boiler carrying 90 lb. steam pressure, what is the proper proportion of oil pressure to use to any stated steam pressure on a boiler?

The oil pressure does not vary with the steam pressure. All that is necessary is to carry sufficient oil pressure to force the oil through the piping, and maintain an equal pressure at the regulating valve of each burner. Usually about 40 lb. is sufficient, but for very heavy firing 60 lb. may be necessary. This is true for 90 lb. steam pressure, or for 200 lb. steam pressure.



# FUEL OIL AND STEAM ENGINEERING

(Stack diameters for conveying fuel oil chimney gases must be altered for varying altitudes above sea-level as in coal burning power plants. Herein is a helpful discussion of methods to be employed in arriving at a proper stack diameter for any altitude, when the diameter for sea level conditions has been previously ascertained.—The Editor.)

## SAVING THE WASTE IN THE CHIMNEY—VII CORRECTION FOR DIAMETER OF STACK AT ALTITUDE ABOVE SEA LEVEL

BY ROBERT SIBLEY AND CHAS. H. DELANY

An important point to consider in the construction of the stack is how the altitude will affect the cross-sectional area. At high altitudes the air becomes less dense, hence the area should be larger in order to pass the required weight of air needed in combustion of the fuel, for the same weight of air is needed for proper fuel combustion, no matter what the altitude may be.

In the flow of gases through pipes, it has been found that the weight passing any given section per minute is

$$W = K \left[ \frac{pDd^5}{\left(1 + \frac{3.6}{d}\right)L} \right]^{1/2}$$

Where K is a constant; p is the difference in pressure between two ends of pipe; D the density; d the diameter of pipe; and L the length of pipe. Since these quantities will later disappear in self-cancelling pairs from this equation, the noting of the particular units involved in measurement is not necessary. In applying this formula to gases flowing through a

stack, the quantity  $\left(1 + \frac{3.6}{d}\right)$  is practically unity,

the quantity L becomes equal to H and  $H_1$  in the respective cases, and p is the same in each case. Hence we have

$$W = K \left[ \frac{pDd^5}{H} \right]^{1/2} \text{ and } W_1 = K \left[ \frac{pD_1d_1^5}{H_1} \right]^{1/2}$$

But W must equal  $W_1$  for the same economy of fuel burning. Hence

$$K \left( \frac{pDd^5}{H} \right)^{1/2} = K \left( \frac{pD_1d_1^5}{H_1} \right)^{1/2}$$

Also

$$\frac{D}{D_1} = r \text{ and } \frac{H_1}{H} = r$$

Therefore, substituting and cancelling

$$\begin{aligned} \frac{D d^5}{H} &= \frac{D_1 d_1^5}{H_1} \\ r D_1 d^5 &= D_1 d_1^5 \\ \frac{H}{r} &= H_1 \\ r^2 d^5 &= d_1^5 \quad \therefore d_1 = r^{2/5} d \end{aligned}$$

### Rule for Altitude Correction

Hence to properly proportion a chimney for a given altitude above sea level, first pick the height and diameter for the boiler capacity on the assumption that the installation is to be made at sea level. Next determine the height for the altitude desired by making the ratio of the new height to the sea-level determination inversely proportional to the barometric readings, or else inversely proportional to the square of the barometric readings, as suggested by C. R. Weymouth. The stack diameter is then increased so that the stack at the higher altitude should have the same frictional resistance as that used at sea-level. This new diameter is deter-

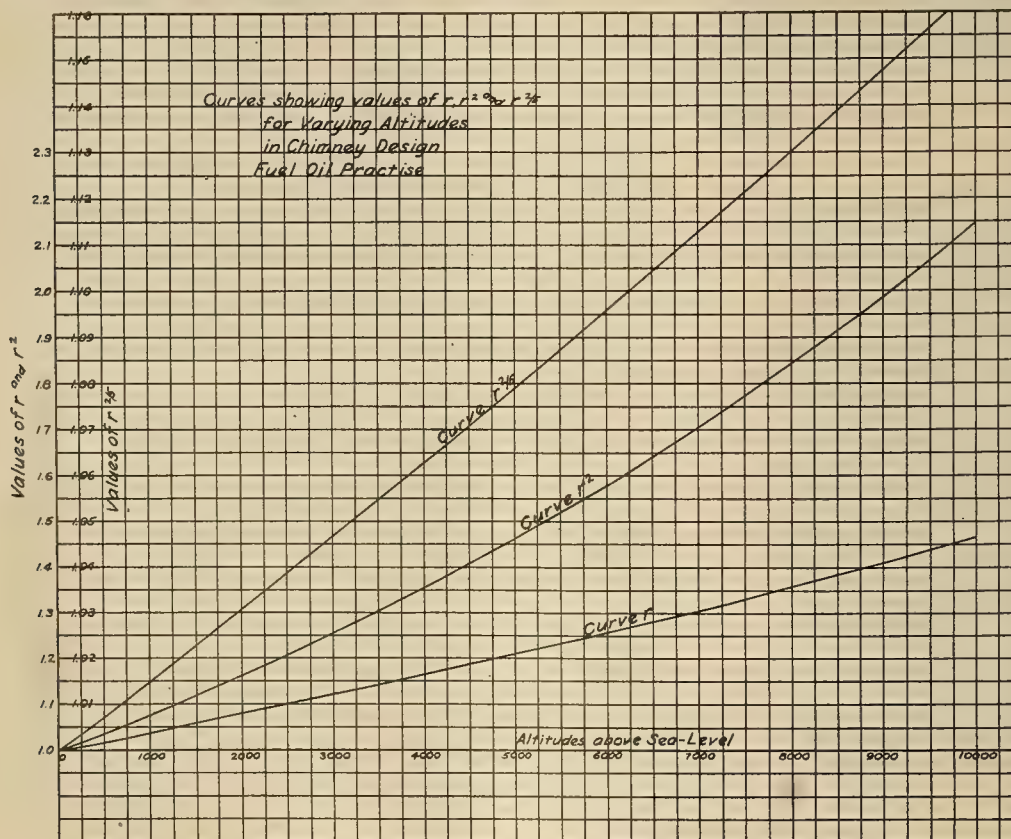
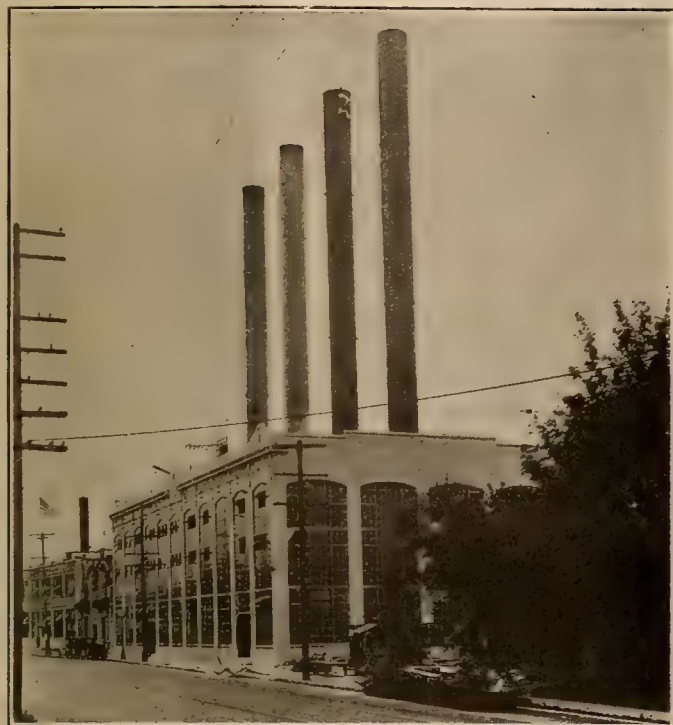


Chart for Chimney Computation at altitudes above sea-level.



mined by multiplying the diameter obtained on the basis of sea-level assumption by the ratio  $r$  of barometric heights raised to the  $2/5$ th power as above deduced.



Typical sea-level installation in metallic chimney design for fuel oil practice. The view shown is that the steam power plant auxiliary for the city of Seattle, Eastlake and Nelson Place.

### An Example of Chimney Design at Altitude

Since it is now seen that the factor  $r$  or ratio of sea-level pressure to the pressure at altitude enters as a first, second, and a two-fifths power, a chart is herewith given by means of which this factor may be quickly raised to the power desired for altitudes up to 10,000 ft., without any reference to barometric pressures.

As an example, let us find the proper proportions of a chimney to amply provide for a 1,000 boiler horsepower installation situated 8,000 ft. above sea-level.

We have hitherto found that the proper dimensions at sea-level for such an installation are 64 inches in diameter for a height of 100 ft. Applying our rule set forth above, we find from the chart that  $r$  for 8,000 ft. is 1.357. Hence the proper height is 135.7 ft. at this altitude, and since  $r$  raised to the  $2/5$ th power is found from the chart to be 1.130 the proper diameter is 72.3 inches.

### A 600-FT. PUMPING LIFT FOR IRRIGATION

BY J. C. STEVENS

What is believed to be the highest pumping lift for irrigation in the Pacific Northwest is at Underwood, Wash., where two hundred acres of orchard and strawberry land are irrigated by means of a turbine and pump lifting water 600 feet.

The pump is a 5-stage centrifugal pump built by the Morris Machine Works of Baldwinsville, N. Y. It is belted to a 24-inch S. Morgan Smith turbine set in an open flume using 60 sec. ft. of water under 18 feet of head, and revolving at 265 r.p.m. The pump

speed is 1,700 r.p.m. and the amount of water raised is 550 gallons per minute.

The pipe line is 5,400 feet long. It consists of 280 ft. of 8-inch national converse steel pipe and the remainder of 8-inch wood stave pipe. The first or lowest delivery of water is under a total head of 450 feet and the last or highest at 600 feet.

Water power for the turbine is supplied by a flume one-half mile long, diverting water from White Salmon River and developing a total head of from 17 to 22 feet, depending on the stage of the river.

The project was completed by the writer in the spring of 1917. Organization was effected under the District Irrigation Laws of the State of Washington. The total bonded indebtedness of the district is \$16,500.00 and the total assessments for interest, maintenance and operation have averaged \$8.00 per acre, while the value of the crops raised has been considerably over \$100 per acre each season.



The pump station and a portion of the pipe line on the Underwood irrigation works. The pump raises 550 gallons per minute.



The power flume on White Salmon River, developing a total head of from 17 to 22 feet.



# Discrepancies in the Electromagnetic Theory

BY DR. A. C. CREHORE

(That no definite solution of the speed of electrons in rings has ever been obtained by means of the electromagnetic theory is shown by this distinguished author to point to a failure of our present electromagnetic theory to account for all phenomena presented to the physicist. By a remarkable instance wherein the average velocity of an electron in the earth is shown numerically to equal the velocity in a ring of four electrons, the author shows that the scheme revealed by the atomic weight table he displays checks up reasonably close with laboratory measurements. This is the eighth contribution of this author to the columns of the Journal of Electricity on The New Physics.—The Editor.)

Having developed a gravitational equation of great generality it is most natural to make every endeavor to test its validity at as many points as possible. The equation referred to is

$$F = \frac{1}{3} e^2 m_0 \Sigma_1 \beta^2 \Sigma_2 \beta^2 r^{-2}.$$

## Calculating the Weight of Atoms

This may be applied to any two bodies of matter, simple or complex. We may, if we choose, apply it to the earth as one of the bodies and to a single atom on its surface as the other body, when the equation will give the weight of the atom. For simplicity let us deal with atoms at first having but a single ring of  $p$  electrons. The equation then takes the form

$$F = \frac{1}{3} e^2 m_0 \Sigma_p \beta^2 \Sigma_E \beta^2 r_E^{-2},$$

one of the velocity summations being taken over the single atom of  $p$  electrons and the other being taken over the whole of the earth, including every electron in every atom in the earth, and the distance  $r$  now becoming  $r_E$ , the radius of the earth.

It was pointed out above that the sum of the squares of beta for the hydrogen atom consisting of a ring of two electrons was

$$\Sigma_H \beta^2 = \frac{hm_H}{e^2 m_0}.$$

But the more general expression for a ring of  $p$  electrons is

$$\Sigma_p \beta^2 = \frac{p^2}{4} \frac{hm_H}{e^2 m_0},$$

which reduces to the above when  $p=2$ . When the attraction of the earth for atoms of different kinds is written down, evidently the only quantity that has any different value for the different atoms is  $\Sigma_p \beta^2$ , for the properties of the earth remain fixed. If the above value for  $\Sigma_p \beta^2$  is used, it is to be observed again that all of the quantities in it remain fixed except  $p$ , the number of electrons in the ring, assuming that there is a single ring atom only. It results from this that the weights of single ring atoms are approximately proportional to the squares of the numbers of electrons in the rings. Therefore, when the weight of any single ring atom is known, it is possible at once to write down the weights of all other single ring atoms. Assuming that the hydrogen atom has two electrons, and atomic weight 1.008 referred to oxygen as 16, the following weights for atoms having rings of  $p$  electrons are obtained.

p Electrons Per Ring	Weight of Ring or Atom
2	1.008
3	2.268
4	4.032
5	6.300
6	9.072

## Speed of Electrons in Rings

It should be remarked, however, that the strict proportionality between the square of the number of electrons and the weight is to be regarded as a first approximation only to the truth. The above formula for the speed of the electrons in rings makes the speed depend only upon the number of electrons in the ring, and is thus entirely independent of the radius of the ring. This is why it is regarded as a first approximation only, the value of the radius playing a minor part as affecting the speed, but yet a real one, and not exactly negligible. This formula is a radical departure from any previous theory of the atom. It contains within it the idea that the cause of the revolution of the electrons is the mutual action of the electrons in the ring upon each other.

According to electromagnetic theory there exists a tangential component of force exerted upon each electron in the ring due to the sum of all of the other electrons in the ring, and this force always acts in the direction of motion of the electron and is never zero at any speed, except the zero speed. And, if the motion should reduce to zero and then reverse going in the opposite direction, this force would also reverse and be in the direction of the motion again. According to this, unless there is some counterbalancing force, there must be a continuous increase of the velocity of the electron, and no uniform velocity would ever be attained, for it is necessary that these tangential forces shall be zero as well as the radial force acting upon the electron before equilibrium is possible. It is supposed in electromagnetic theory that the counterbalancing force is that due to the action of the selected electron upon itself, but it is not possible to find what this force is without making certain assumptions with regard to the electron itself, which have the effect of begging the question, and, hence, no definite solution of the speed of electrons in rings has ever been obtained by means of electromagnetic theory.

## Electromagnetic and Gravitational Theories

This seems to be one of the cases where the electromagnetic theory we now possess is deficient. It is our diagnosis that the equations of electromagnetic theory as applied to rings of electrons are not correct, and the point where they require modification has been rendered evident by this gravitational theory. It will be pointed out in a later section that there is a factor, the so-called Doppler factor, in



these equations that requires modification. It is not easy to make it clear here just what this factor means, but it arises from the introduction of the ideas sometimes referred to as retarded potentials, in which we have two different times to deal with, the time when the effect of the motion of the distant body arrives at the given body, and the time when it left the distant body. According to the recent work of Maga Nad Saha it has been pointed out that one of these times should not be a time simply, but should depend upon the space coordinates as well, referring in fact to a generalized Minkowski space having four coordinates, x, y, z, and t.

The gravitational equation that we have been using was obtained by supposing that this Doppler factor is sensibly equal to unity, and the results obtained by making this supposition are the justification for it, especially since it has been pointed out by Saha that a change in it is demanded. If, now, we follow the same course in regard to the equations as applied to rings of electrons, then they lead to a definite value of the speed at which the tangential forces referred to above vanish, and thus afford a definite solution for the speeds of rings of electrons. However, the numerical values thus obtained are not to be trusted for the reason that there are other deficiencies in the electromagnetic equations, which will be referred to in a later section. These are also revealed by the gravitational equation.

Factors in the Weight of an Atom

After these remarks, which have led us somewhat away from the subject before us, let us return again to the weights of rings of electrons as given in the table above. Due to the suggestion contained in this table an attempt has been made to ascertain from the known weights of different kinds of atoms the particular combinations of rings of electrons which will add up to make the exact known weight of the atom in question. After many trials it has been found that, by slightly altering the weights in the above table and making the weight of the rings as follows, the exact weights of a large majority of the atoms may be obtained.

p Electrons Per Ring	Weight of Ring
2	1.008
3	2.29643
4	3.99975
5	6.2895
6	9.137

The table calculated by means of these numbers only is given in Table A below.

For example, it is supposed that the atom of magnesium consists of the following combination of eight rings of electrons, 27 electrons altogether,

5 rings of four = 5 × 3.99975 = 19.99875

1 ring of three = 1 × 2.29643 = 2.29643

2 rings of two = 2 × 1.008 = 2.016

Total = 24.3112

The measured atomic weight of magnesium is 24.32, and, if an error as great as one unit in the last decimal place has been made in the measured weight, the calculated weight comes within the experimental error.

It is not necessary to comment much upon this table, but it may be stated that the real test of the

TABLE A

	At. Wt. Observed O = 16 H = 1.008	At. Wt. Calc. O = 15.9990 H = 1.008	Total No. of Elec- trons	Arrangement in Rings in Atoms					% Error in Measured At. Wt.	% Differ- ence in Calculated At. Wt.
				2	3	4	5	6		
H	1.008	1.008	2						0.0993	0.000
He	4.00	3.99975	4	1		1			0.25	-0.00616
Li	6.94	6.8893	9		3				0.144	-0.731
Cl	9.1	9.1371	6					1	1.10	0.408
H	11.0	11.0235	14	3		2			0.909	0.214
C	12.00	11.99926	12			3			0.0833	-0.00616
N	14.01	14.01587	16	2		3			0.0714	0.0376
O	16.00	15.9990	16			4			0.0625	-0.00616
F	19.0	19.023	22	3		4			0.526	0.121
Ne	20.2	20.3115	23	2	1	4			0.495	0.552
Na	23.00	23.0228	26	3		5			0.0435	0.099
Mg	24.32	24.3112	27	2	1	5			0.0413	-0.0362
Al	27.1	27.0225	30	3		6			0.369	0.0384
Si	28.3	28.3109	31	2	1	6			0.3533	0.0387
P	31.04	31.0223	34	3		7			0.0822	-0.0571
S	32.06	32.0625	40	8		6			0.0312	0.00793
Cl	35.46	35.4488	29			1	5		0.0282	-0.0315
A	39.88	39.8953	43	1	3	8			0.0251	0.0384
K	39.10	39.054	46	7		8			0.0256	-0.1175
Ca	40.07	40.062	48	8		8			0.02495	-0.0199
Sc	44.1	44.062	52			9			0.227	-0.0867
Ti	48.1	48.062	56	8		10			0.208	-0.0800
V	51.0	51.053	58	7		11			0.196	0.1045
Cr	52.0	52.061	60	8		11			0.192	0.1178
Mn	54.93	54.919	61	4	3	11			0.0182	-0.0208
Fe	55.84	55.831	38	1				6	0.0179	-0.0165
Co	58.97	58.020	62	3		12			0.0169	0.0857
Ni	58.68	58.638	66	6	2	14			0.01705	-0.0717
Cu	63.57	63.613	68	3	2	14			0.01573	0.0683
Zn	65.37	65.317	69	3	1	15			0.0153	-0.0814
Ga	69.9	70.012	72	2		17			0.1431	0.1599
Ge	72.5	72.589	74	2	17				0.1379	0.1228
As	74.96	75.020	78	3		18			0.0133	0.0795
Se	78.2	79.185	80	2	2	15	2		0.1262	-0.0192
Br	79.92	79.905	68	1	4	10			0.0125	-0.0185
Kr	82.92	82.917	89	4	3	18			0.01206	-0.00378
Rb	85.45	85.494	91	2	5	18			0.01169	0.0512
Sr	87.63	87.612	92	3	2	20			0.01141	-0.0206
Yt	88.7	88.900	93	2	3	20			0.1127	0.226
Zr	90.6	90.604	94	2	2	21			0.1104	0.00407
Cb	93.1	93.181	96		4	21			0.1074	0.0868
Mo	96.0	96.026	100	4		23			0.1042	0.0275
Ru	101.7	101.595	104	1	2	24			0.0983	-0.1033
Rh	102.9	102.883	105		3	24			0.0972	-0.0162
Pd	106.7	106.603	110	2	2	25			0.09375	-0.0912
Ag	107.88	107.891	111	1	3	25			0.00927	0.0103
Cd	112.40	112.306	115	2	1	27			0.00889	-0.0838
In	114.8	114.883	117		3	27			0.0871	0.0720
Sn	118.7	118.602	122	2	2	28			0.0842	-0.0826
Sb	120.2	120.305	123	2	1	29			0.0832	0.0876
Te	127.5	127.456	125	2	26	3			0.0784	-0.0346
I	126.92	126.938	109	2	7	15			0.00788	0.0145
Xe	130.2	130.288	131		1	32			0.0768	0.0680
Cs	132.81	132.795	140	3	6	29			0.00753	-0.0110
Ba	137.37	137.312	141	3	1	33			0.00728	-0.0420
La	139.0	139.015	142	3		34			0.0719	0.0112
Rare Earths.										
Ta	181.5	181.590	184	1	2	44			0.0551	0.0496
W	184.0	184.021	188	4		45			0.05435	0.0116
Os	190.9	190.878	193		3	46			0.05238	-0.0115
Ir	193.1	193.174	196		4	46			0.0518	0.0385
Pt	195.2	195.293	197	1	1	48			0.0512	0.0474
Au	197.2	197.308	201	3	1	48			0.0507	0.0550
Hg	200.6	200.613	206	4	2	48			0.04985	0.00650
Tl	204.0	204.020	208	4		50			0.0490	0.00965
Pb	207.20	207.292	209	1	1	51			0.00483	0.0443
Bi	208.0	208.052	216	8		50			0.04806	0.0249
Nt	222.4	222.315	227	4	1	54			0.04495	-0.0381
Ra	226.0	226.034	232	6		55			0.0442	0.0152
Th	232.4	232.331	239	6	1	56			0.0430	-0.0298
U	238.2	238.282	239		1	59			0.0420	0.0344

scheme is to be found with the elements of lower atomic weight. The table has been extended clear on through the periodic table of elements on the strength of the fact that the elements of low atomic weight seem to reveal that the atoms are largely built up of rings of four electrons. This is a matter which may be tested by means of the gravitational equation. How this may be will now be stated.

Testing Atomic Weights

If we should take any piece of mixed matter made up of a large variety of atoms, the chances are that, if the atoms are really constituted as indicated in this table, the number of rings of just four electrons would greatly exceed any other kind of ring. By taking just one atom of each kind indicated by this table we would have a total of

1470	rings	of	four	electrons
185	"	"	two	"
86	"	"	three	"
35	"	"	five	"
7	"	"	six	"



thus indicating that the number of rings of four electrons greatly exceeds all others. If this is so, then the average speed of an electron in this mass of mixed matter must be very nearly the same as the speed in a single ring of four electrons. Now, by means of the gravitational equation, the average speed of the electrons in the earth or in any other body may be found. If it comes out the same as the speed in a ring of four electrons, or nearly the same, this affords a test of the atomic weight table just given.

Let us first choose the earth for the test. Write down the attraction of the earth for a single hydrogen atom on its surface, both by means of Newton's law and by means of the gravitational equation, and then equate their values. The first is

$$F = k' m_H m_E r_E^{-2},$$

and the second is

$$F = \frac{1}{3} e^2 m_0 \Sigma_H \beta^2 \Sigma_E \beta^2 r_E^{-2}.$$

Upon equating the  $r_E$  cancels, and we find

$$\Sigma_E \beta^2 = \frac{3 k' m_H m_E}{e^2 m_0 \Sigma_H \beta^2}.$$

All of the quantities in the right member are known quantities, and the expression, therefore, gives us the sum of the squares of the speeds of all of the electrons in the earth. The numerical values are

$$\begin{aligned} k' &= 666. \times 10^{-10} \\ m_H &= 1.662 \times 10^{-24} \\ m_E &= 5.984 \times 10^{27} \text{ grams mass of earth.} \\ m_0 &= 0.90 \times 10^{-27} \end{aligned}$$

$$\Sigma_H \beta^2 = \frac{h m_H}{e^2 m_0} \text{ (see above)} = 0.531 \times 10^{-4}.$$

Hence we find

$$\Sigma_E \beta^2 = 1.825 \times 10^{47}.$$

Dividing this number by the total number of electrons in the earth must give the average square of the velocity of a single electron in the earth. The mass of the earth used above in grams is  $5.984 \times 10^{27}$ , and the number of electrons in each gram of matter is equal to the Avogadro constant,  $6.062 \times 10^{23}$ . Hence the number of electrons in the earth is approximately.

$$N = 6.062 \times 10^{23} \times 5.984 \times 10^{27} = 3.6275 \times 10^{51}.$$

Dividing the  $\Sigma_E \beta^2$  by this number gives the average square of the speed of a single electron in the earth as

$$\beta_E^2 = 0.503 \times 10^{-4},$$

and

$$\beta_E = 0.0071.$$

For comparison with this speed the numerical values of the speeds of electrons in rings according to the preceding formulæ are:

p Electrons Per Ring	$\beta$ = the velocity in terms of the velocity of light
2	0.003641
3	0.005462
4	0.007283
5	0.009104
6	0.010925

The average velocity of an electron in the earth is, therefore, very close indeed to the velocity in a

ring of four electrons, the comparison being 0.0071 to 0.007283. The velocity is thus much nearer to that of a ring of four than to that of any other ring. This supports in a very satisfactory manner the scheme revealed by the atomic weight table above.

## Technical Hints

### SIZE OF CENTRAL STATION STORAGE BATTERY

BY LOUIS ETSHOKIN

(Handling the peak load in the most efficient manner frequently involves the use of storage batteries in the power station, the size of these being dependent upon the various factors which are here discussed.—The Editor.)

In power stations, especially steam, where it is desirable to maintain a high load factor, and thus run all machines at full power and high efficiency, storage batteries form a very desirable means of taking up excess power when not needed, and supplying a deficiency when needed.

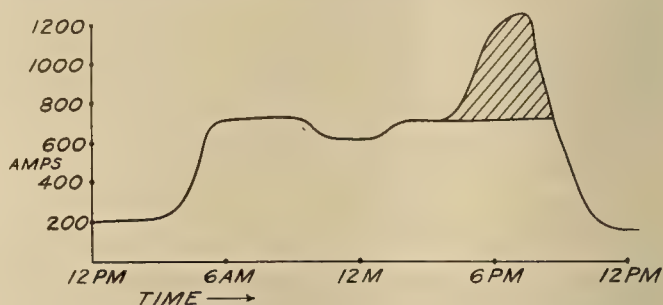


Fig. 1. Diagram illustrating the demand on a small d.c. station during a period of twelve hours, the shaded area representing the ampere-hours to be taken care of by means of storage batteries.

Assume that the unbroken curve of Fig. 1 represents the demand on a small d.c. station delivering power at 120 volts at the station. We have a steady power load during the day and a sharp lighting load in the evening. Our generator capacity is 800 amperes and we wish to take care of the peak by storage batteries. The amount of ampere hours that we are going to take care of is represented by the shaded area in Fig. 1.

$$\text{This area is approximately } (1200 - 750) \times \frac{4}{2}$$

or 900 amp.hr. That means that we must supply a total of 900 amp.hr. to the system in four hours.

We have said that our generator voltage is 120. Therefore in order to supply current to the system, the voltage of the storage batteries must always be slightly above 120, that is, enough above 120 to supply the requisite current which may be as high as 450 amps.

There are two alternative ways of supplying sufficient ampere-hours. It would seem that we could use storage batteries of 900 amp.-hr. capacity at the four-hour rate, which makes an average discharge rate of 225 amperes. The trouble with this method is that the momentary peak load of 450 amps. would be discharging the batteries at about the  $1\frac{1}{2}$ -hr. rate, and consequently we could hardly get 900 amp.-



hr. out of them with any success. It is, of course, a well known fact that the higher the rate of discharge the lower the amp-hr. capacity of a given cell. To be on the safe side we would have to use cells of 1200 amp.-hr. capacity at the four-hr. rate.

Fig. 2 represents the charge and discharge curves of a lead cell. The limiting voltage of discharge should not be below 1.75 volts at the four-hr.

rate. This means that we must have  $\frac{120}{1.75}$  or 69

cells, say 70 cells. With the necessary supply of power according to the curve of Fig. 1, and 70 cells of 1200 amp.-hr. capacity, we will have an ample storage battery. There will be no danger of the voltage falling below 1.75 volts providing the battery is always fully charged at the time the peak load starts. So much for one method of choosing the battery.

The other method would be to have larger but fewer cells, i. e., cells which could supply all the ampere-hours needed and still have a drop in voltage of, say from 2.0 to no lower than 1.9 volts. To do this we would need cells which could run for eight hours at the same rate at which our former cells were running for four hours. This would mean a cell of at least one and one-half times the capacity of

the former; the number could not be cut down sufficiently to warrant this increased size. Consequently

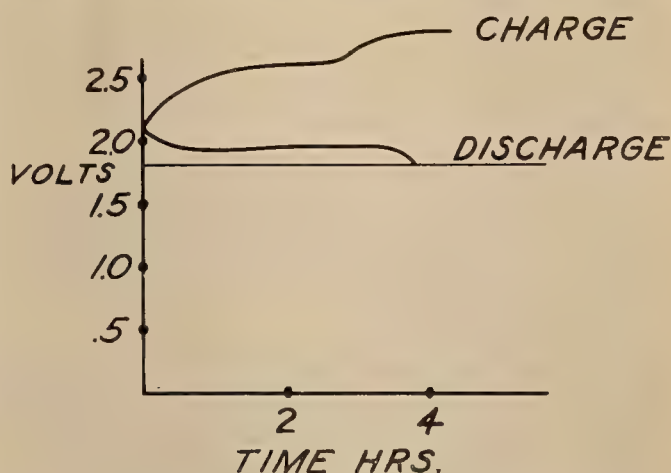


Fig. 2. Diagram of charge and discharge curves of a lead cell.

the first method, of completely discharging the cells, would be cheaper and more advisable.

However, as was stated before, great care would have to be taken that the cells received a full charge each day. Means for accomplishing this will be discussed later.

## The Development of Electrical Installation Aboard Ships

BY F. A. ANDERSON

(In the February 1st issue of the Journal of Electricity appeared the first part of this article, dealing with past developments in marine electrical installation. The concluding section traces the probable line of future development in the light of the special requirements of shipping. The author is electrical inspector with the U. S. Shipping Board in San Francisco.—The Editor.)

In the first part of the article I endeavored to give a brief outline of the electrical installation on ordinary ships and its development from the early stages to present day practice. The next great step in electrical installation aboard ships can be gauged, to a great extent, from the signs of the times.

### New Type of Wiring

The distribution system will be wholly of lead and armored cable. Cable will be developed to meet conditions found to exist on ships. Circuits will be run in the shortest well defined route, being plainly marked and so arranged as to be easily traced from source to each outlet. At every place where a cable is cut specially designed fittings will be installed. These will make steam and water tight connection with both fitting and cable, and the cable will also be hermetically sealed, as in a pot head, precluding all chance for the admission of moisture. Special ways will be provided where cables may be carried in convenient groups. These ways will be unobstructed by other apparatus, or be in a form similar to ducts with accessible hand holes. Instead of running through cargo spaces a runway will be provided along the deck. Such a runway could be conveniently provided by securing Z bars to deck with a cover over the Z bars. Removable plates at predetermined points will provide hand holes for accessibility to the cable. Cables could be secured in place within this

runway, and being of a type unaffected by water, no trouble from that source need be feared.

Where a number of wires are required in one circuit, a special cable could be provided, or a group of smaller cables used.

### Future Ship's Fittings

Fittings will be of a universal character. A universal box of convenient type and size will be established, while interior fittings and covers will produce various types of outlets required.

The design for lamp outlets must be water and steam tight without the use of outer glass globe, while the globe and guard will be added as a precautionary measure.

The interior and cover for the plugging in device will be made water tight without the use of the usual cap. In other words, a fitting must be designed which will allow the insertion of the plug and its making connection to the circuit without opening the whole interior of the fitting, leaving it subject to filling from the spray of a hose, or the wash from a wave. And the fitting will be installed so that gravity will drain it of any water which may enter. Individual switches will be designed which permit ready operation and which are made water tight without the use of rubber gaskets. All fittings will be coated inside with a compound possessing both insulating properties and ability to resist corrosion.



Such an installation will prevent faults common in present day practice; will relieve the ship's engineer from endless search for a circuit in trouble; will remove many of the prejudices which now exist and will prove a valuable investment in saving the cost of numerous repairs and in the long life of service which it will give.

### Introducing Electric Drive

This, however, is but a small part of the future electrical installations aboard ships. The electrically driven ship is rapidly gaining favor and the time is not far distant when it will be an accomplished fact for commercial ships.

This is not a new idea. About twenty-five years ago there appeared in Washington, D. C., a man with ideas and patents for an electrically driven ship; he brought with him a fully equipped model and secured permission to place this model in the committee room of the United States Senate Committee on Naval Affairs, where it was exhibited and explained to many men of prominence, being finally brought to the attention of the Navy Department, where some consideration was at the time given to the matter. Although it has lain dormant for many years it is, perhaps, the seed from which have grown the electrically driven battleships of today, the New Mexico, now the flagship of the Pacific Fleet, and her sister ship, the California.

Let us return to commercial ships and the possibilities in this direction. The first step will, perhaps, be electrically operated auxiliaries.

### Motor Driven Auxiliaries

It is present practice to duplicate all steam driven auxiliaries. We will consider first their replacement by a motor driven type. Such an arrangement would contemplate two generating sets of ample capacity for the ship's load with perhaps a smaller generating set capable of providing sufficient power for the vessel when in port. These units would be of the turbine driven type employing the efficiency of the high speed operation.

Engine room auxiliaries, being motor driven, could be of a more compact form. They should, as far as possible, employ motors of the same size, or perhaps two sizes, in order that the spares necessary would be reduced to a minimum. All parts should be made to perfect interchangeability in order that repairs, when necessary, could be easily and rapidly made.

These motors should be rugged in construction and of a type developed for ships service where conditions injurious to the ordinary motor exist. The operating and starting devices should be simple in design and should preclude, as far as possible, contacting and automatic devices which are liable to fail in operation. Motors on which commutators are used should be provided with some means to protect the commutators not alone from mechanical injury, but from other injurious conditions. The development of these motors will probably also lead to an improvement in the motors used on ice machines, in the machine shops, and for the operation of the rudder, and such other places where motors have

before been used in ship work, but where full success has not been attained. The greatest difficulty will be experienced in the deck machinery. This machinery is exposed at all times to the elements. Often it is a wash from the waves of the sea. This machinery includes the cargo winches of which there are about ten to an ordinary cargo ship. It also includes an anchor-hoisting wench located on the extreme bow of the ship, the warping wench and steering engine, located on the after part of the ship. The electrical profession must develop a motor that will stand this service. We should not rely wholly on the commercial motor of today or try to improvise means for using it.

### Motor Driven Propellers and Auxiliaries

In such an installation the ship's engine room would become practically a floating central station. The equipment would perhaps include duplicate steam turbine driven generators. These could employ turbines on which the higher degrees of superheat could be used, and through this and the fact that the high speed can be transmitted to the generators without the means of reduction gears, would increase the efficiency of the unit. Higher voltages could be employed and the principal auxiliary motors and the main motors for driving the propellers could be wound accordingly. There would be no reversing of the main engines and they would therefore require less constant attention.

The main motors operating the propeller or propellers would be located aft and be controlled from the bridge. This arrangement dispenses with the heavy propeller shafts and also relieves the engine from the strain of reversing. Many of the present signaling devices between the bridge and the engine room could thus be eliminated and the danger of a misunderstood signal removed. The control of the ship would be ready at the master's hand and he would be able to send his engine forward or back, fast or slow, by the simple movement of a lever.

This equipment would in general employ the motor driven auxiliaries previously described, in which instance, however, it might be advisable to include in the installation transforming devices, in order that the small auxiliaries could use a motor of a lower voltage than that employed on the main motors and principal auxiliaries.

### Diesel Type Vessel

By this I mean the Diesel, or similar type internal combustion engine, which must almost of necessity employ electrically driven auxiliaries. A vessel with main Diesel drive and electric auxiliaries is comparable with the steam turbine ship having electric auxiliaries, only with the added advantage that in the Diesel ship the boilers are dispensed with. Their space and weight, as well as the storage space for the water necessary to supply them, is conserved to the ship and there is added to the vessel a cargo-carrying capacity.

One step further and we see the electrically driven ship with the Diesel engine direct connected to main generators; the propellers and all auxiliaries driven by motors. This is the ship of the future,



when the ingenuity and ability of the American engineer have developed such equipment to a satisfactory standard.

Direct current versus alternating current for the most satisfactory service, is still open to discussion, and this will perhaps ever remain a point at issue between engineers who are advocates of the two systems. Each system has its points of advantage, each has its limitations. There will arise problems unknown at the present day. They will be met. Difficulties will be overcome and success will be assured.

### Electrically Operated Naval Vessels

Returning again to the electrically operated ship of the Navy. Much has been written concerning this in the technical press, and while to some it is but a simple application of known electrical principles to a new use, to others it presents a most intricate system of engineering. It is certain that it required most competent engineering ability to devise and carry out the scheme and all credit is due to the engineers who, with untiring zeal, accomplished the feat. To those familiar with the operation of the ship, its control is simplicity itself. The interlocking levers and switches have been designed to provide against almost every mishap, and yet a layman or one unfamiliar with the apparatus sees in it only a maze of handles and complication of apparatus. The whole installation is of such magnitude that one familiar with an ordinary cargo ship is apt to see in it such a massive installation that he is awed into believing it unsuited for commercial use. It is necessary for such a person to realize that much of this equipment is applicable only to battleships and naval vessels, and to understand that much greater simplicity will be developed in the commercial ship.

I think that it can be truthfully stated that the battleship New Mexico has, in its short history, proven that an actual saving of forty per cent in operating expenses is obtainable in an electrically driven ship of this character over the old type steam driven ship. It is an interesting fact that the electrical personnel required for the maintenance and operation of the electrical propulsion equipment on the battleship New Mexico is only about half that which is required to maintain the fire control and intercommunicating system on this ship.

### Advantages of Electrically Driven Ships

Among the advantages which electrically driven ships offer over those with steam operation are the saving in steam and exhaust lines, numerous valves and fittings, long heavy shafts, reduced size of boilers (in the Diesel type ship their elimination altogether); heavy propelling shafts as well as the freedom in the jar and strain of the reciprocating motion often present in main drives and their auxiliary apparatus. The saving in weight and the conservation of space thus produced adds to the cargo carrying capacity of the vessel and its service value to the owners.

### Ship's Telephone

Another electrical feature, which is destined to add to the success of the future cargo or freight ship, is the telephone. Recent developments have produced a telephone capable of satisfactory service in this field. It is particularly rugged in construction, has been made water tight throughout and possesses the essential feature of being able clearly to transmit the sound of the voice, but is practically unaffected by other and external noises. The installation of such a telephone in the pilot house, or on the bridge of a ship, with a telephone aft in the steering engine room, another in the main engine room, and one located on the bow of the ship, gives the master of the vessel a most adequate control. In docking a vessel the master can instantly and effectively transmit his orders for handling lines and can give his commands for the operation of the engine with greater facility.

### Development of Technical Engineering

Many can remember when the technical engineer was, with few exceptions, limited to the civil engineering profession, and have seen technical training grow until every line has been specialized and worked into an engineering profession. This has been the result of cooperation, and cooperation has produced our great American engineering societies, whose recognition is becoming more pronounced each day. The American Institute of Electrical Engineers is beyond all doubt the recognized authority for electrical matters. Its rules have become standard wherever electrical apparatus is required. It is to them that the shipbuilding industry will look for the future of electrical installation aboard ships, and that it is of a character to insure success.

## THREE CONVENTIONS WHICH WILL MAKE 1920 MEMORABLE

### ELECTRICAL SUPPLY JOBBERS

Del Monte Hotel—May 12-14

### PACIFIC COAST SECTION, N. E. L. A.

Hotel Maryland, Pasadena—May 17-18

### N. E. L. A.

Hotel Huntington, Pasadena—May 18-21

Find a substitute to carry on your business over these dates—you can have no substitute at the convention



## SPARKS—Current Facts, Figures and Fancy

(The bits of information in these columns vary from the latest in air travel de luxe to the cost of discovering America. Landmarks of radio and telegraphic advance are also herein recorded.—The Editor.)

Air travel de luxe has been inaugurated by a British transport company which has introduced in connection with its air service a luncheon basket containing sandwiches, fruit and chocolate, while wicker holders for bottles and glasses are affixed to the walls of the state room.

\* \* \*

We read that on the rapidly growing Iceland telegraph and telephone system there are 752 subscribers in Revkiavik, 139 in Akureyri and 79 in Vestmannaeyjar. No wonder the subscribers increase. Anyone would want a telephone installed just for the pleasure of calling some simple little number like Vestmannaeyjar 6489-J.

\* \* \*

The oldest tune in the world is said to be that of "For He's a Jolly Good Fellow." Its origin is too distant to be fixed but it can be traced in Asia and Africa as well as in most European countries. It is supposed to have been learned from the Babylonians by the Egyptians, and Asia Minor Arabs still sing it. It survives also in many European folk songs.

\* \* \*

By stringing its telephone wires on trees, fences and bushes a rural telephone company unwittingly provided clothes lines for the women of the neighborhood. Finding that the service was remarkably poor the company investigated, and found that the women, not knowing that this unimpressive arrangement was part of a telephone system, had been cutting the wires and using them for hanging out the family wash.

\* \* \*

The radio device by which sending is expected to be speeded up to from 300 to 400 words a minute was suggested by a method used by the Germans to prevent their messages between Madrid and Nauen from being picked up by the allies. The Germans perforated their messages on a tape and ran this through a sending machine at high speed. It was picked up at the other end on a phonograph, which took it as a continuous buzz, but when run slowly gave it out in recognizable form.

\* \* \*

To encourage the use of electric power in connection with agriculture and irrigation, Italy is paying a premium of 0.03 lire per kilowatt-hour for a period of not more than 10 years, to firms or individuals, for current used exclusively in the cultivation and harvesting of crops. The same premium will also be paid where irrigation works are supplied with water electrically pumped. Those operating electric plants enjoying subsidies from the government are obliged to reserve a portion of the current produced,

up to 10 per cent, which must be furnished at the price made to the most favored user for agricultural and reclamation projects.

\* \* \*

How much did it cost to discover America? From some old documents recently brought to light in Genoa, Italy, it appears that the operating expense, including the cost of equipment, of discovering America was about \$7,000. The value of Columbus's fleet is given as \$3,000. Columbus's compensation, presumably with reimbursement for the actual cost of subsistence while connected with the work, was \$300 a year, while his two captains received a salary of \$200 a year each. The members of the crew, so the record shows, were paid \$2.50 a month. If the present rates for "mileage and personal expenses" had prevailed in Columbus's time, imagine the figure this expedition would have cut in the national budget!

\* \* \*

A new wireless "calling-up" device intended mainly for saving life at sea was recently demonstrated in England. The device will enable a ship in distress automatically to ring alarm bells on board any vessels within range, and will do away with the necessity for an operator to be always on duty. The apparatus consists of an automatic transmitter, which will send out a special signal with accuracy, and a reliable receiver which will respond to this signal, and this signal only. It will ensure general and immediate attention being given to emergency calls, such as "S.O.S." and "T.T.T.," the ice warning. The device was used, it is stated, during the war for exploding mines, and its action was illustrated by gunpowder being fired by wireless from a station 30 miles away.

\* \* \*

Sending up aeroplanes to ascertain the peculiarities of its higher atmosphere is a plan recently adopted by Salt Lake City in an investigation of the causes of the smoke nuisance in that city. Not far off are a number of huge plants for smelting metal ores. For a long time a theory has been entertained to the effect that sulphur dioxide gas from these plants spreads an invisible cloud high in the air and holds down the city's smoke, preventing it from getting away. To test this theory, aeroplanes were sent up above the smoke with specially constructed vacuum bottles in which to collect samples of air far aloft. At various levels in the atmosphere the bottles were opened and immediately closed after swallowing their fill of air. Afterward the air in the bottles was analyzed and it was found to contain hardly any sulphur dioxide. Thus the theory was definitely disproved.



## PERSONALS

Emmet N. Britton, superintendent of gas distribution at Sacramento for the Pacific Gas & Electric Company, has



resigned to become associate editor of the Journal of Electricity. Mr. Britton received his education at the University of California with the class of 1914. After leaving the university he went into the employ of the Pacific Gas & Electric Company, serving in the new power district created by the installation of the Drum Power Plant, where he remained until the outbreak of the war. In the war

he served in the heat of battle in the Argonne as First Lieutenant of the 363rd Regiment of the Ninety-first Division. He is the author of a book entitled "As It Looked to Him," which is a compilation of intimate letters on the war. Mr. Britton is the youngest son of John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, and it is believed that his writings and earnest devotion to journalism augur much for the continued helpfulness and service the Journal of Electricity is rendering to the West.

B. J. Grigsby, a Chicago manufacturer of electrical supplies, has recently been in San Francisco.

A. W. Jones, manager far east department, International General Electric Company, Schenectady, is a recent visitor at San Francisco, en route to Japan and China.

R. H. Ballard, president of the National Electric Light Association, has just returned to Los Angeles after an extended trip throughout the states in the interests of the Association.

M. J. Verdery, Jr., has been made manager of range sales for the Great Western Power Company of California. Mr. Verdery was previously with the Edison Electric Appliance Company.

A. Ter Kühle of Soerabaya, Java, arrived on the Shinyo Maru Feb. 12, 1920. He is an engineer of the Oost Java Stoomtram Maatschappij and is visiting the United States en route to Holland.

J. B. Fiskien, formerly chief engineer of the Washington Water Power Company, has been made consulting engineer for the company, having in charge certain important special work. V. H. Greisser becomes chief engineer.

G. Binder, Yokohama officer of the International General Electric Company, arrived in San Francisco aboard the Shinyo Maru Feb. 12th. He will spend several months at the general offices of the company at New York and Schenectady.

Joseph Ripley, who has been for a year or more in China supervising the survey work in the improvement of the Grand Canal, has recently returned to this country. He and his family are spending some time on the Pacific Coast prior to returning to Mr. Ripley's home in the East.

Tom Bennett of the Rex Electric Company, San Francisco, has the distinction of leading the "San Francisco Electrical Golf Club," which gathers at 12:30 each Tuesday afternoon on the green links of Lincoln Park. Great activity is being displayed by the enthusiastic golfers of the electrical industry.

Clarence Quilty has taken over the management of the Century Electric Company, San Jose, California, looking after

the interests of his sister, Mrs. Somers, widow of the late Frank J. Somers. Mr. Quilty is a graduate of the University of California and has had experience as a merchandiser in various lines.

Robert E. Bond, secretary of the Baker-Joslyn Company with headquarters in San Francisco, has ordered for shipment to the Island Electric Company, Waikiki, Island of Maui, T. H., a new 150-B.hp. Diesel engine with 125-kva. Westinghouse generator. Mr. Bond is president of the Island Electric Company.

Aubrey Drury, associate editor of the Journal of Electricity, leaves the staff on March 1st to devote his attention to the Drury Service (Advertising—Publicity), 295 Monadnock Building, San Francisco. Mr. Drury hopes to maintain his connection with the electrical industry by advising in its advertising activities.

L. S. Ready, head of the gas and electric department of the California State Railroad Commission, has been made chairman of the recently-organized Joint Committee on Efficiency and Economy of Gas, to investigate the subject of gas quality. The committee is made up of gas experts representing the Commission and the gas companies.

H. H. Corey, member of the Oregon public service commission, has received notice of his appointment to serve on the grade crossing and trespassing on railroads committee by the national association of railroads and utilities commission. There are seven members of this committee representing widely scattered sections of the United States.

James H. McGraw, of New York City, president of the McGraw-Hill Company, owners of the Journal of Electricity, is expected in San Francisco about the middle of March. Mr. McGraw, who has become a great enthusiast over the West, expects to remain in California until after the convention of the National Electric Light Association at Pasadena, May 18-21, 1920.

A. S. Lindstrom, well known to Pacific Coast electrical men on account of his connection with the Panama-Pacific International Exposition as assistant chief of the Machinery Department, and subsequently as sales representative of a number of eastern manufacturers, has opened an office in San Francisco at 519 California Street as representative of the Electric Furnace Construction Company of Philadelphia, the Fischer Machine Company of Philadelphia, and the Piano Motors Corporation of Camden, New Jersey, and other allied accounts.

W. E. Herring, industrial agent of the Puget Sound Traction Light & Power Company, has left Seattle for Boston, where he joins the engineering staff of the Stone & Webster Engineering Corporation. He is accompanied by Mrs. Herring and they will make Boston their future home. Mr. Herring came to Seattle from Portland in 1913 to become the industrial agent of the traction company and has been with the organization ever since. He was formerly chief engineer of the forest service with headquarters in Washington,



D. C. Between 1909 and 1913, he was water-power engineer for the forest service with headquarters at Portland, Oregon, and with jurisdiction over the water power region of Oregon, Washington and Alaska. During his residence in Seattle he was a member of the industrial bureau of the Chamber of Commerce and during 1918 was vice-chairman of the executive committee of the chamber. His associates and friends in the Northwest wish him all success in his new work.



Will J. French, member of the Industrial Accident Commission of the state of California, addressed the first meeting in 1920 of the San Francisco Electrical Development League on "The Relation of Light to Safety," reviewing the provisions of the new Industrial Lighting code recently put into effect. Mr. French expressed full confidence in the cooperation of the electrical industry in apprising manufacturers of the requirements of modern illumination. He believes that proper lighting is an important factor in the conserva-



tion of labor. Mr. French is well qualified to speak in behalf of the workman, having served as president of the San Francisco Labor Council, Typographical Union No. 21, and the Allied Printing Trades Council.

S. M. Kennedy, general agent of the Southern California Edison Company, is among recent visitors to San Francisco.

J. F. Pollard, formerly of the Sierra & San Francisco Power Company, has been made general manager of the Coast Valleys Gas & Electric Company with headquarters at Salinas, California.

J. C. Clark, associate professor of electrical engineering at Stanford University, and now undertaking special work for the General Electric Company, is a recent visitor at Spokane, Seattle, and Portland.

L. M. Edwards, for the past four years foreman of the De Sabla Power Plant of the Pacific Gas & Electric Company, has resigned to accept the position of superintendent of the Paradise Irrigation District.

J. M. Morris, sales engineer of the Westinghouse Electric & Manufacturing Company of Los Angeles, was in San Francisco February 18-20, attending the meetings of the N. E. L. A. meter committee.

F. J. Zorn, manager of the Seattle district of the Pacific States Electric Company, is resigning to engage in private business in Seattle. He will be succeeded by Roy Worth, who has been his assistant for several years.

Dr. Iwaichi Notomi, director of Shibaura Engineering Works, Tokyo, with a party of ten engineers from the same company, arrived in San Francisco on the Shinyo Maru Feb. 12, 1920. This party will spend several months at the Schenectady Works of the General Electric Company.

E. O. Shreve, San Francisco manager of the General Electric Company, has been re-elected president of the San Francisco Electrical Development League for the coming year. Mr. Shreve has proven himself an able executive in directing the affairs of the League—so much so that the League is today a power in the industry in and about the San Francisco bay district and is rapidly being recognized as one of the strongest of this type of organizations existent in the nation today. "Bill," as he is affectionately known to the industry,



strongly resembles Abraham Lincoln in physical poise and in mental aspiration, and his all-pervading smile is here shown as he is telling his wife of the wonderful opportunity he sees ahead for the industry on the Pacific Coast during the next year.

George E. Emmons, one of the vice-presidents of the General Electric Company from Schenectady, recently spent a few days in San Francisco on his way to the southern part of the state where he is going for a short vacation.

Dr. S. Kondo, director and chief engineer, also S. Arimura, chief electrician of the Japan Hydraulic Power Company, Ltd., arrived on the Shinyo Maru February 12, 1920, en route to eastern cities for a visit of several months.

R. A. Hopkins, of the Los Angeles office of the Westinghouse Electric & Manufacturing Company, has recently returned to his duties after having been confined to his home for many weeks, due to an injury he received in one eye.

L. A. Osborne, vice-president of the Westinghouse Electric & Manufacturing Company and president of the Westinghouse International Company, has been spending some time in San Francisco. Mr. Osborne is a member of the San Francisco Chamber of Commerce committee which is going to Japan for the purpose of investigating trade conditions.

A. J. Forbess, superintendent of transmission for Southern Sierras Power Company, has resigned his position and joined the organization of the Amalgamated Sugar Company with headquarters in Ogden, Utah, a concern which operates four factories in Utah and three in Idaho. Mr. Forbess will be electrical engineer for the company and will also fill the position of traveling engineer for the Ogden factory. Mr. Forbess is one of those whole-hearted fellows who are loved by everyone. He has been particularly active in the affairs of the National Electric Light Association and for the last year has been one of the most successful members of the Membership Committee. The best wishes of all his friends go with him in his new venture. His former position with the Southern Sierras Power Company will be filled by W. H. Brown.

## OBITUARY

P. C. Ensley, for the past ten years salesman for the Graham-Reynolds Electric Company, died of influenza on

December 22, 1919, at his home in Los Angeles. Mr. Ensley was a very prominent figure in the electrical field in Southern California, and his travels in this territory during the past six years had brought him in contact with many members of the industry. He took a very active part in local electrical organization and was at one time secretary of the Jovian Electric League. The many friends and co-workers

among whom he had become a familiar figure, deeply mourn his loss.

A. C. Hansen, city engineer of Los Angeles, passed away due to influenza on Feb. 14, 1920.

Harold McGill Davis, manager of the advertising department of the Sprague Electric Works of the General Electric Company since 1899, died on February 9th at his home in Brooklyn, N. Y.

A. V. Saph, consulting engineer of San Francisco, who has had much to do with the civil engineering side of irrigation and power development in central California, died of influenza Feb. 10, 1920.

Henry S. Carhart, celebrated physicist and an electrical authority of international reputation, died, due to a cerebral hemorrhage on Feb. 13, 1920. Mr. Carhart was in the faculty at the California Institute of Technology, Pasadena, California.





## Meeting Notices for Electrical Men

(Important in electrical activities at this time are plans for the big electrical conventions ahead. An interesting session of the Arizona Gas, Electric Light and Power Association is reported from the Southwest, as well as meetings of the contractors and dealers. Engineering societies and contractor-dealer associations are both active in the Northwest, while exceptional meetings of local organizations have been taking place in San Francisco.—The Editor.)

### Meeting of Southern Contractors

Members and guests of the Southern California Association of Electrical Contractors and Dealers, to the number of fifty-five, met in the Walker Theater Hall in Los Angeles on the evening of Feb. 13. At the close of the meeting eight new applications for membership in the association were received.

The meeting opened with an address by G. E. Arbogast, president of the association, who spoke in a general way of the purpose of the California Electrical Cooperative Campaign, calling attention to the highly commendable results that have been accomplished to date. Plans for 1920 were discussed and a great deal of interest was shown in this and following talks.

Capt. Angus spoke of the responsibility of the contractor and dealer to the industry, showing how the campaign has answered this question. A. L. Spring outlined the uniform accounting system and demonstrated its value to the dealer. Overhead expenses were discussed by B. F. Fanning and a black-board demonstration of the itemized costs involved in residence wiring was given by B. R. Hensel.

According to Mr. Arbogast, the situation of the electrical dealer and contractor looks better than ever before. There is some shortage of both labor and materials but this is not serious. As far as labor troubles are concerned, there seem to be none in Los Angeles.

### A. I. E. E., Seattle Section

The Seattle Section of the American Institute of Electrical Engineers met on the evening of February 17th at the Arctic Club assembly room, G. E. Quinan, chairman, presiding.

Chairman Quinan announced that E. S. Code had accepted chairmanship of the membership committee. Other members have not been selected. Mr. Terrell announced that plans had been made for a trip of inspection of the Milwaukee electrification as soon as the road is operating electrically. Special notices announcing the trip will be sent out to determine the number who can go.

Amos Slater, president of the Associated Engineering Societies, has announced a conference of engineers of Oregon, Washington, Idaho and Montana, for April 6 and 7, for the purpose of discussing the proposed government department of public works.

E. J. Barry, consulting electrical engineer of Tacoma, presented a very interesting and practical paper on the subject, "Electricity in Pierce County Coal Mines." Mr. Barry has participated in the electrification of various industries

of the Northwest and is therefore thoroughly conversant with the subject. The general problems involved in the installation and operation of electrical equipment in and around a coal mine were discussed and the installation of an armored cable in the Wilkeson mine was described in detail. The discussion following the reading of the paper was general. Chairman Quinan gave reminiscences of his experiences in mines in the Coeur d'Alenes and expressed to Mr. Barry the appreciation of the Section for his instructive paper.

### Technical Societies of Los Angeles

R. L. Eltringham, electrical engineer of the Industrial Accident Commission of the State of California, spoke in Los Angeles, February 18th, on the General Lighting Safety Orders, applying to industrial lighting, which became effective December 1, 1919.

It is estimated that at least fifty per cent of the industries will be affected by these orders and at this meeting Mr. Eltringham, together with Mr. Blythe, vice-president of the Goodyear Tire & Rubber Company, and Mr. Myron Hunt, a prominent architect, explained these orders and the benefits to be derived from them in the way of improved lighting and decrease in accidents.

The meeting was under the auspices of the Joint Committee of the Technical Societies of Los Angeles.

### Oregon Association of Electrical Contractors and Dealers

At the regular meeting of the first district of the Oregon Association of Electrical Contractors and Dealers, Feb. 9th, the report of the committee on the draft-

ing of the new electrical code for the city of Portland was received and the association passed a resolution favoring adoption in its present form.

At the regular meeting on Feb. 16th, a joint resolution was passed with the Master Heating and Piping Contractors and the Master Plumber Association, and addressed to the Commission of Public Docks in Portland, that in the future all bids on their work be called for separately instead of as a part of the general contract.

It was decided to hold meetings every two weeks after the meeting on February 23rd. The association being asked to donate electrical material for the wiring of the "Pisgah" home, arranged to do so.

### Mining Convention in Northwest

The annual convention of the Northwest Mining Association was held in Spokane, Washington, Feb. 16th to 21st. Feb. 20th was designated as Engineers' Day and the sessions were under the auspices of the Columbia section, A. I. M. E.

### BUILDERS OF THE WEST — LXXII



GEORGE ELLERY HALE

Long after the fuels of the earth and our present inexhaustible water power supply shall have been exhausted, the great untouched fields of possible energy of the sun will be available for the uses of man. To George E. Hale, Director of the Mount Wilson Solar Observatory, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his work in solar investigations, that have made the West the Mecca toward which all eyes look for unfoldment of the sun and its possible uses for mankind.





"AS HYDROELECTRIC ENERGY IS PUT ON THE LINE in ever increasing quantities, so will the West go ahead in development agriculturally and industrially." The details of this interesting and important meeting held in the Palace Hotel in San Francisco, February 10, 1920, may be found on the opposite page.



### THE VISION OF ELECTRICAL DEVELOPMENT IN THE WEST

The view shown on the opposite page is the speakers' table at a recent noonday luncheon in the Palace Hotel of San Francisco, where an audience of five hundred men prominent in business and civic affairs of the West are gathered to hear the message of electrical development of the West. The meeting was under the auspices of the Rotary Club and the Electrical Development League of San Francisco and was held Feb. 10, 1920. The one emphatic message driven home was that the West will go ahead no faster in development than additional kilowatts of electrical energy are thrown on the line. Two hundred and fifty million dollars is needed in California alone during the next five years in hydroelectric development to adequately meet the needs of agriculture and industry, and by mass meetings and appearances before civic bodies in the cities and hamlets of the state, men of the electrical industry are showing that every citizen is vitally affected from a self-interest viewpoint in the stability of hydroelectric enterprises so that the development of the state might proceed unhampered. D. E. Harris, vice-president of the Pacific States Electric Company, is chairman of the meeting shown in the illustration and Robert Sibley, editor of the Journal of Electricity, is the speaker, while at the speakers' table are representatives from practically every phase of business activity in central California. Among the electrical men at the speakers' table are A. E. Wishon, president Pacific Coast Section, N. E. L. A.; Clyde Chamblin, president California Association of Electrical Contractors and Dealers; Tom Doane, president of the Rotary Club; E. O. Shreve, president of the San Francisco Electrical Development League; H. F. Jackson and P. M. Downing, vice-presidents of the Pacific Gas & Electric Company.

#### A. I. E. E., Denver Section

At the regular meeting of the Denver Section of the A. I. E. E., held on February 21st, Wilson A. Carter gave a digest of the engineering license laws of the United States. This was followed by a popular discussion of the subject.

#### Idaho Engineering Convention

The joint annual meeting of the Idaho Society of Engineers and the Idaho Irrigation Congress was held in Pocatello, January 12-14. The three days of the convention were given over to consideration of the subjects: highways, irrigation operation and maintenance, and irrigation development.

#### A. I. E. E. and N. E. L. A., Portland Section

A regular monthly meeting of the Portland Section of the A. I. E. E. and N. E. L. A. was held on February 10th. E. L. Kavanaugh, electrical engineer with the Detroit Electric Furnace Company, presented a paper on the subject of "The Electric Furnace for Brass Melting." The paper dealt with the history of the electric furnace in the melting of copper and its alloys and was illustrated by means of motion pictures and lantern slides. The furnaces being installed at the plant of the Oregon Brass Company are the largest of this type west of St. Louis.

#### American Association of Engineers

J. J. Rosedale has been appointed chairman of a committee to propose changes in the Building Code, in order to secure greater protection from fire. This action was taken as a result of the lecture last month by Jay Stevens, of the Western Bureau of Fire Underwriters, on the subject, "America's Greatest Crime." The American Association of Engineers are taking up many civic questions in line with their policy to offer the public their services in matters pertaining to the profession of engineering.

#### Portland American Association of Engineers

At a recent meeting of the Portland chapter of the American Association of Engineers, O. Lauregaard, chairman of the State Board of Engineering Examiners, gave a talk

on the new law and the actual handling of the registration of engineers. At the present time there have been 1600 engineers registered by the board.

A committee was appointed to go to Oregon Agricultural College and report on the needs of the engineering department, as there are 800 engineering students enrolled. The voters of the state will vote on a mileage tax at the next election, to overcome increased cost of operation and the addition of a few extensions.

#### Development League Elects Officers

Col. E. E. Winslow, U. S. A., was the speaker of the day at the Feb. 16th meeting of the San Francisco Development League. Col. Winslow presented in an instructive way some of the interesting uses made by electricity during the war.

At this meeting officers for the ensuing year were elected, as follows:

President—E. O. Shreve, General Electric Company.  
First Vice-President—J. F. Bollard, Sierra and San Francisco Power Co.  
Second Vice-President—Arthur Kempston, San Francisco City Department of Electricity.  
Secretary-Treasurer—R. D. Compton, Pacific Gas & Electric Company.  
Executive Committee: R. A. Balzari, Westinghouse Electric & Manufacturing Company; W. H. Kohlwey, Kohlwey Electric Company; R. W. Duval, Pacific Gas & Electric Company; Harry Hall, Holbrook, Merrill and Stetson.

A decision was reached to submit to the members, by postcard vote, the proposition of compiling a photographic roster of all the members.

#### Santa Clara Valley Electrical Contractors and Dealers Association

At a recent meeting of the Electrical Contractors and Dealers' Association of Santa Clara County, the following officers were elected:

President—Charles Faser, 68 South 10th Street, San Jose.  
Vice-President—Henry Doerr, 44 W. San Fernando Street, San Jose.  
Secretary—Paul D. Cambiano, 161 South 2nd Street, San Jose.  
Treasurer—Harry Guilbert, 276 W. Santa Clara Street, San Jose.

#### Short Circuit Club Luncheon

A luncheon was held by the Short Circuit Club in the cafeteria in the Edison Building, Los Angeles, on January 24th. This organization is composed of the employees of the Southern California Edison Company working in the general office and the Los Angeles district.

Music was furnished by the Edison orchestra and glee club. There was also a bit of jazz rendered by Harry Ross, saxophone, and Benny Burke, piano. Short talks were made by Charles H. Peirson, C. P. Staal and D. M. Trott.

#### GEORGE ELLERY HALE

The distinguished scientist to whom this issue of the Journal of Electricity is dedicated, the Director of the Mount Wilson Observatory at Pasadena, is one of the only six Americans honored with election as Foreign Associate in the Académie des Sciences, Institut de France. The Foreign Associates are limited to twelve, the list of former American Associates being as follows:

Benjamin Franklin,	elected in	1772
Count Rumford	" "	1803
Louis Agassiz	" "	1872
Simon Newcomb	" "	1895
Alexander Agassiz	" "	1904

Mr. Hale was also awarded, in 1904, the Gold Medal of the Royal Astronomical Society.

Among his many activities for the advancement of science is the initiation of the International Research Council, and the organization of the National Research Council, of which he acted as chairman.

Among the notable achievements for which Mr. Hale is responsible is the development of the spectroheliograph, an invention which has contributed immeasurably to the work of solar research.



## N. E. L. A. Convention Plans

(The Pacific Coast is to be the scene this spring of three most important electrical conventions—the N. E. L. A. convention, the Jobbers convention, and the convention of the Pacific Coast Section, N. E. L. A. Some promising plans for the last named are given below, together with a list of the papers to be presented. These papers will be published in full in the April 15th issue of the Journal of Electricity.—The Editor.)

The Pacific Coast Section is in the midst of preparations for the annual convention at Pasadena, California, May 17th to 18th. As this convention will be held just prior to the national convention at Pasadena, an unusually large attendance and a most successful meeting is assured. The present plan is to hold morning, afternoon and evening sessions on Monday, May 17th, leaving Tuesday, May 18th, free for welcoming Eastern delegates to the national meeting.

As each committee has prepared a full program of papers, the short time available will allow only brief abstracts of these papers to be presented by the authors, followed by five five-minute prepared discussions. All sessions will be joint meetings of the Commercial, Engineering, Accounting and Publicity Sections. Papers will be printed in the February 15th and April 15th issues of the Journal of Electricity, and distributed to the members in ample time for study before the convention.

In addition to preparing the convention papers, each of the committees has been performing much constructive work. The Publicity Committee in conjunction with the California Electrical Cooperative Campaign has been especially active in promulgating the thoughts embodied in the "Self Interest" idea of President A. E. Wishon. A semi-monthly press service is being supplied to all member companies for use of local newspapers, a special appropriation of \$1250 having been provided for this purpose. Engineering Committee members have attended various National Committee meetings in the East. The Commercial Committee, with the endorsement of the Executive Committee, has actively aided the California Industrial Accident Commission in the preparation and enforcement of its "Safety Lighting Code" and "Electrical Utilization Orders." A special committee under the direction of T. E. Bibbins is laying the groundwork for national publicity on the material contained in Garnett Young's paper on "How the Electrical Industry Should Cooperate with the Architect and Builder."

Special mention should be made of the work of the Membership Committee, under the direction of Chairman H. N. Sessions. As the result of a most energetic campaign, hundreds of new members have been secured, and many more are in prospect.

Bills for 1920 dues were sent to all Pacific Coast Section members early in January. Many have already paid. Those who have not yet done so are earnestly requested to send in check in payment at once so as to insure necessary copies of papers to be presented at the Pasadena convention.

### Committee Meetings Postponed

The meeting of the Advisory Committee of the Pacific Coast Section, N. E. L. A., has been postponed from February 25th to March 5th.

The meeting of the N. E. L. A. Committee on Cooperation which was to be held in New York on February 6th has been postponed to some date late in March.

### Meeting of Arizona Association

The Arizona Gas, Electric Light and Power Association held a two-day session in Phoenix, beginning February 18th. The Association was addressed at this time by R. H. Ballard, vice-president of the Southern California Edison Company and president of the National Electric Light Association.

In addition to outlining a program for the annual electrical convention which will be held in Pasadena, May 19 to 22, Mr. Ballard convincingly brought before Arizona executives just what the great electrical organizations of America are striving to achieve.

Mr. Ballard, in the course of his address, said that the administration water power bill just passed by the United States Senate, and which awaits the President's signature, is expected to make possible the development of 5,000,000 horsepower in the Western states alone, and that work then will be commenced to relieve the shortage of power all over the nation.

Following is a list of some of the prominent electrical executives who were in Phoenix at this time and who met with the corporation commission at the capitol:

R. H. Ballard, president National Electric Light Association, and Mrs. Ballard, Los Angeles; Mr. and Mrs. R. W. Wilde, Kingman; W. H. Onken, editor Electrical World, and Mrs. Onken, New York; H. L. Chandler, Mesa; W. S. Sultan, Globe; M. V. Watson, Prescott; J. A. Shepherd, Bisbee; K. E. Van Kuran, Los Angeles; J. W. Kurst, Tucson; N. G. Wellsin, Tucson; C. D. La Moree, Los Angeles; H. B. Johnson, Bisbee; N. P. Dudley, El Paso; F. E. Russell, Tucson; M. Harrington, Flagstaff.

## Convention Papers, Pacific Coast Section, N. E. L. A.

### ENGINEERING COMMITTEE

- "Railway Electrification," by J. E. Woodbridge
- "Method of Improving Power Factor, and Suitable Rates," by E. A. Quinn
- "Use of Maximum Rated Motors as Affecting Central Stations and Consumers," by John Hood
- "Electric Furnaces," by J. A. Koontz and W. M. Shepard
- "Economic Use of Galvanized Steel Wire," by J. P. Jollyman and J. F. Strachan
- "Progress Report on Insulator Investigations," by J. A. Koontz
- "Relay Protective Systems," by G. E. Armstrong
- "Automatic Protection of Small Motors," by G. E. Armstrong
- "Use of Variable Speed A.C. Motors vs. D.C. Motors for Elevator Service," by S. J. Lisberger

### ACCOUNTING COMMITTEE

- "Construction Accounting," by C. P. Staal
- "Standardization of Titles," by A. B. Carpenter and R. R. Reidford

### COMMERCIAL COMMITTEE

- "How the Electrical Industry Should Cooperate with the Architect and Builder," by Garnett Young
- "The Value of Proper Illumination," by F. D. Fagan
- "Commercial Aspects of Railway Electrification," by E. B. Criddle, W. L. Frost and G. B. Kirken
- "Commercial Aspects of Storage of Water at Higher Elevations," by E. B. Walthal, D. R. Kenney and E. J. Crawford
- "Central Station Power versus Internal Combustion Engines," by R. E. Fisher
- "Standardization of Wiring Devices, Terminals and Budgets," by H. H. Courtright
- "Electrical Development of Oil Lands," by R. A. Balzari
- "Value of Solicitors," by A. W. Childs
- "Statistics Regarding Unelectrified Horsepower," by J. O. Case

### PUBLICITY COMMITTEE

- "Report of Activities," by I. W. Alexander

Let your plans include Pasadena, May 17-21



# HAPPENINGS IN THE INDUSTRY

## NEW PLANT IN OIL FIELDS

The San Joaquin Light & Power Corporation plans the immediate erection of a power plant near McKittrick in the oil fields west of Bakersfield, where natural gas is available for fuel. There is an abundance of gas in this neighborhood, some of which is now going to waste. It has a remarkable fuel value, being equal to oil at sixty cents a barrel.

According to A. G. Balch, vice-president of the company, working plans are being prepared at this time and work will begin immediately. At the present time a turbine generating 12,000 kilowatts will be installed, but the building will be designed for extension as needed. Stirling type boilers will be used, equipped with a duplicate set of burners so that either natural gas or oil may be burned. Condensing will be accomplished by either a cooling pond or tower. The electrical apparatus will be standard in every respect.

The plant will feed into the 130,000-volt transmission line which forms the backbone of the San Joaquin system. The work will be in charge of E. A. Quinn, general superintendent, and it is planned to have the plant on the line in about ten months.

The initial installation will cost about one million dollars. A similar unit of 12,500 kilowatts capacity and also using gas for fuel is being installed in the old steam plant at Bakersfield. This will be ready for service in time for the summer load.

## PROPOSED RULES FOR EXTENSION OF ELECTRIC SERVICE

The public service commission of Oregon has proposed the following rules to apply to the extension of electric service in that state:

1. Free extension shall be made within the corporate limits of cities and towns where the prospective annual revenue is equal to one-half the cost of extension.

2. For other than the conditions applicable under Rule 1, the utility may require the prospective customer or customers to advance the actual cost of extension. Each customer shall receive credit for the amount advanced, against which credit shall be applied for a period not to exceed five years:

(a) Monthly, one-half of each customer's own monthly bill.

(b) Annually, one-half of the revenue of all customers to whom no credit applies, whether attached to the original extensions or to an additional extension thereto. The annual credits will be apportioned among customers with unused credit in proportion to the amount of unused credit remaining before each such apportionment.

In no case shall the credit on bills exceed the original amount advanced.

The utility may make free extensions beyond the corporate limits where the prospective revenue justifies such decision.

3. Where a utility is financially unable to comply with the provisions of Rule 1, the provisions of Rule 2 may be applied, in which case the customer's account will be credited annually, for a period of three years, with interest at the rate of eight per cent per annum for the total amount advanced.

The costs of extensions considered assignable to the customer within the corporate limits in the case of lighting customers shall be considered as the minimum investment reasonably necessary safely to extend the secondary lines (or primary line when in lieu thereof) to the customer. In the case of all power customers and all customers outside of

city limits, the cost of extension shall be considered also to include the primaries and transformers reasonably necessary to supply the prospective consumers. Pole, wire and transformer capacity put in to satisfy future or other than the customer's needs, and service wires and meters shall not be included in the cost of extension, assignable to the customer.

## HETCH-HETCHY SITUATION

Fear that work on the Hetch-Hetchy project will come to a standstill if funds are not provided immediately was expressed at a recent conference with the Mayor of San Francisco.

The action of the Finance Committee of the Board of Supervisors in calling off proposals for the sale of Hetch-Hetchy bonds caused the city engineer to stop the work of cutting down the remaining trees standing in Lake Eleanor. The Department of the Interior insists that the trees be taken out as a part of the city's contract with the Government.

If the work on the project is brought to a standstill, the city will have to operate its railroad and power plant just the same. The power plant, however, will pay for itself.

According to City Attorney George Lull, it will require a charter amendment to increase the interest on the bonds, and this will be impossible for at least a year. The Legislature, in turn, would have to approve this action, and that body does not meet until 1921.

According to members of the Board of Supervisors, the present condition of the bond market is responsible for the Hetch-Hetchy crisis.

## Electrical Goods Have Big Place in Modern Homes

**Electrical Goods Have Big Place in Modern Homes**

**Electricity Does Much to Improve Home Conditions**

**25 YEARS OF GOOD WILL**  
**Hydrolux Electrical Co.**  
 Electrical Workmen - 1215 Howe St.

EVERY WOMAN KNOWS THAT HER HOMEWORK IS A BUNDLE OF SHIRTS. GLOOM CAN'T LIVE IN THE SAME HOUSE WITH SHIRTS. EVEN A HOUSEWIFE WITH A PERSONALITY IF IT IS A **Hydrolux**.

THE HOUSEWIFE KNOWS THAT QUALITY PLUMBING SERVICE EQUALS A HAPPY HOUSEHOLD.

SHE HAS LEARNED THIS LESSON: **HYDROLUX SERVICE MUST BE GOOD OR THEY COULD NOT HAVE GROWN TO A SALES VOLUME SO GREAT THAT TWO THIRDS OF THE ELECTRICITY USED IN THE UNITED STATES TODAY ARE **Hydrolux**.**

BUY ELECTRICAL GOODS FROM YOUR ELECTRICAL DEALER.

**People Selecting Goods as Proper Christmas Gifts**

**Electric Washing Machines, Ironing Machines, Sewing Machines, Heating Vacuums, Cleaners, Kitchen Gas and Electric Ranges, Coolers, Etc.**

**NOTICE**

Our Windows for Xmas Suggestions

**WATERHOUSE-WILSON**

**For Christmas - A Eureka Cleaner!**

**12" Down**

**Nathan Dohrmann & Co.**

**LEARN TO MAKE YOUR HOUSEHOLD ELECTRICITY YOUR SERVANT**

**WHAT ELECTRICITY CAN DO FOR YOU**

**Electrical Page**

**CHRONICLE TOMORROW**

**Electric Company**  
 San Francisco

## AN ELECTRICAL PAGE

The above is an example of the electrical page now printed regularly in most of the leading Western newspapers. It is expected that an electrical section will soon be as well established as the regular automobile section. The insert in the lower right hand corner shows how the San Francisco Chronicle arouses interest in its own electrical page by running an advertisement in the preceding issue.



### DISCUSSION OF WATER POWER PROBLEM

At a recent meeting of the Water Power Committee of the Commonwealth Club, the work of the water power committees for a number of years back was reviewed and suggestions were made as to topics that might be discussed by the Water Power Committee during the coming year. The chairman told how the federal water power bill had recently passed the Senate and House and is now in the Conference Committee, where important changes will probably be made before the bill is again submitted to vote. It was suggested that the committee might discuss the provisions of the bill in its present form with a view to having the Commonwealth Club make recommendations to the Conference Committee on any one of the provisions.

The purpose and significant extracts from this bill appeared in the last issue of the Journal of Electricity. It is believed that its passage will awaken new interest and make possible the development of water powers which have heretofore been impossible, owing to the character of permit which has been in force for a number of years, and under which it has been necessary to work and finance should these developments have been undertaken.

The chairman stated that at the last meeting of the public utilities committee of the Commonwealth Club, a plan was suggested for the construction of storage reservoirs and the utilization thereof for irrigation and water power by any present districts or new districts that might be formed in the state. The plan suggested is a radical departure from the general scheme for development and for this reason the water power committee will probably discuss this matter further.

The committee's attention was also called to the general subject of conservation, a matter particularly important at this time because of the increasing cost of all commodities entering into the generation of power by steam, particularly fuel oil. It is generally known that each of the large public utility companies of the state have already planned to develop various water power sites. These are being planned to relieve as quickly as possible the present shortage of power and also to keep pace with the increasing demands for power.

The general idea of those present was that a series of papers covering the general development of our water resources might be undertaken and presented at one of the evening meetings of the club, which papers would set forth the value to the state of the developments both for power and irrigation heretofore made, the large annual demands made on the companies for power, the importance of conserving the fuel oil supply rather than using large quantities of oil for power generated by steam. It was also suggested that a paper should be presented showing the obligation of the general public to support those endeavoring to develop these resources.

In a memorandum presented by W. L. Huber to the Committee on Water Power attention was called to the fact that at the present time, an effort is being made to cut down all appropriations. Incidentally the appropriation of the water resources branch of the U. S. Geological Survey is in danger of a cut when it should in reality be even increased to carry on only the work now in progress. Mr. Huber emphasized that it would be a calamity to have any of the stream flow records broken, as only continuous records are of much value in making storage studies, and because it is only storage projects which will completely develop our Western projects.

### N. E. L. A. COURSES POPULAR

The educational courses fostered by the National Electric Light Association are becoming exceedingly popular among business and educational institutions. The Philadelphia Electric Company have an enrollment of 215 in the commercial engineering course. Other popular courses are

those in practical electricity, elementary accounting and the highly specialized course in electric utility accounting which covers all phases of the subject and the best modern practices of the Association's most progressive companies.

### REGULATION OF RADIO SYSTEMS

Legislation has been recommended to the Senate to regulate the operation of commercial wireless systems now that the privately owned plants, taken over during the war, have been turned back by the Navy Department under the President's recent proclamation.

This announcement was made by Senator Poindexter of Washington, chairman of the Naval Affairs sub-committee which has been investigating the question of radio control for many months. The chief remaining question to be decided by the committee, according to Senator Poindexter, is whether the supervision of the commercial radio services should be placed in the hands of the Navy Department, the Commerce Department, or a specially created commission composed of representatives of various governmental departments.

The Navy Department itself has suggested a bill establishing a licensing system to be administered by the Commerce Department for the regulation of commercial radio companies. This bill would empower the Secretary of Commerce to fix rates in the license when granted. The sub-committee is disposed to adopt some such measure as this because of widespread fear that when the radio plants go back to private hands, users of wireless service will be compelled to pay much higher rates.

Up to the present time the Navy Department has been furnishing transoceanic press and commercial service at a rate of 6 cents a word. But since February 29th, it is understood that the Navy Department will have to discontinue this service, because it has no special authority from Congress to receive commercial or press messages for transmission over the Government-owned wireless systems.

### FIVE NEW THEATERS FOR LOS ANGELES

The rapid increase in the population of Los Angeles, together with the closing of many cafes and similar places of amusement as a result of prohibition, has caused a demand for more theaters. Five new buildings, all of the first order, are now planned. Since the picture theater presents unusual opportunities in the matter of interior illumination, the announcement of these new buildings is of especial significance to the electrical industry.

At the corner of Sixth and Hill streets the First Methodist Church, an old landmark, is being wrecked and on this site a picture palace costing in the neighborhood of \$2,000,000 will be erected by Sid Grauman, owner of the theater on the ground floor of the Edison Building and also of the Rialto on South Broadway. Mr. Grauman and J. L. Lasky have recently purchased a large lot at the corner of Hollywood Boulevard and Orchid Avenue in Hollywood, where they plan to erect a picture theater costing \$250,000.

The Marcus Loew interests, which control Metro pictures, have acquired a long term lease on the southwest corner of Seventh and Broadway from Arthur Letts. This is considered the most valuable corner in the city. Plans for the theater building which is to adorn this site will soon be announced.

Mercantile Place, a narrow street running from Broadway to Spring street and owned for many years by the city school board, has been sold to a syndicate which will build a combination store, office and theater building. This is in the very heart of the present shopping and amusement district.

Pantages Circuit is just completing an immense theater building at the corner of Seventh and Hill streets. The finishing work is now being done and it will be ready for occupancy about April first.



## MEMBERSHIP CAMPAIGN, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

In the electrical engineering field there are many men eligible for membership in the American Institute of Electrical Engineers, who, if properly approached, would quite willingly make an application for membership. These men may fully appreciate the value to them of membership in the Institute, but have procrastinated in communicating with Institute headquarters regarding membership. On the other hand, they may not have had it brought home to them with sufficient force that each one may make great personal gains by affiliation with an association of the influence and standing of the A. I. E. E. If the former is the case, the member noting the prospect—if he is on the membership committee or not—should take it upon himself personally to see that an application blank is provided without delay. If the latter, that full information is given as to the benefits and privileges of membership in the Institute; that the local membership committee is notified of the name of the prospect and that the whole matter is followed up to a successful conclusion.

By following out the suggestions given above, the members may be of the greatest assistance to their section committeemen. And it should be remembered that the Institute belongs not alone to the officers and committee members, but to all the members.

C. A. TURNER,

Chairman Membership Committee, San Francisco Section.

## TRADE NOTES

### Water Heater Sales Increase —

The Pacific Manufacturing & Electric Company of Los Angeles, manufacturers of the Everhot Electric water heater, have given the Electric Appliance Company of San Francisco an agent-jobber commission. Sales of the Everhot heater have been very heavy in the southwest, due largely to the intensive range campaigns of the various power companies.

### New Intermountain Company —

The Wolf Point Electric Light & Power Company has been incorporated under the laws of the state of Montana, capital stock \$100,000. The officers are as follows: O. C. Johnson, president; Morse Lesterud, secretary; A. P. Tills, vice-president and general manager. The plant was formerly owned by John Lesterud.

### Department Sales Meeting —

During the week of February 9th, the annual sales meeting of the Cutler-Hammer switch and specialty department was held at the head office in Milwaukee. The work done the previous twelve months was briefly reviewed, followed by a general discussion of all the switches, sockets, and wiring specialties in the C-H line. Tentative plans were outlined for the future. Among the interesting features mentioned was the widespread and remarkable increased use of C-H 70-50 switches, which have been so extensively advertised through the trade publications and national magazines. All salesmen present expressed their appreciation of the co-operation given by jobbing and supply house salesmen and cited incidents where all concerned had benefited.

### Change of Company Name —

The stockholders of the Anderson Specialty Company have sanctioned a resolution authorizing a change in the name to Anderson Electric & Equipment Company. There is no change either in the officers or in the company's organization. The change has been made solely to render the corporate name more descriptive of the character of the products manufactured and to eliminate the word "Specialty," which did not properly describe the Anderson line of goods.

This company is well known as the manufacturer of the "Autoreelite," the spot light on a reel, and the "Reelite" or extension garage portable.

### New Manager —

H. E. Stocker, who for a number of years was production manager of the Fort Wayne Works of General Electric Company, has become general manager of Roth Brothers & Co., motor manufacturers, Chicago. In his new position, Mr. Stocker has entire charge of the company's affairs. Recently, Roth Brothers & Company have developed their business into a wider field of motor application and the addition of Mr. Stocker's abilities to this long established organization will greatly supplement its strength. New facilities are being provided for the manufacture of a greater output.

### Increased Foreign Distribution of Products —

The export division of the United States Rubber Company, known as the United States Rubber Export Company, is adding to its facilities for the exportation of rubber insulated electrical wires, cables, tapes and like materials. Already twelve direct branches and numerous distributors, carrying stocks of these commodities, are operating in important foreign centers. Experienced representatives in restricted territories throughout the world are introducing and promoting the sale of American made wire and allied products.

### New Water Power Machine —

The Stuart Water Power Machine Company has opened offices in Tacoma and has in view the construction of a factory for the manufacture of a pump, the invention of William A. Stuart, which is to be operated by the fall of water alone. It was designed for lifting water to any height, at the least possible cost after installation, and will be utilized in irrigating large farm tracts. Machines are to be constructed proportionate in size to the amount of land to be irrigated. It is claimed for the device that the natural fall of water is sufficient to pump enough water into reservoirs to irrigate any acreage of land. A model of the machine is now on exhibition at the offices of the company.

### Change of Offices —

Peerless Light Company of Chicago, Ill., formerly located at Halsted, Adams and Greene streets, has moved its office and factory to Washington Boulevard, Meridian and Union streets. The new home is a substantial brick building, six stories high, possessing a large basement, and with a total floor space of about 125,000 square feet. It has been fitted up with all the known devices that expedite production and minister to the comfort and safety of executives, office assistants, and workmen.

### Contract For Marine Machinery —

The Westinghouse Electric & Manufacturing Company announces that the Merchant Shipbuilding Corporation has awarded it the contracts for the propelling machinery for two new ships being built at the company's Chester, Pennsylvania, yards, for the Shawmut Steamship Company. These ships, which were designed for general cargo service, will be of about 10,000 tons d.w., and are to have a speed of thirteen knots.

### Foreign Orders for Steel Mill Equipment —

An order for the first steel mill electric motor ever built for a large reversing slabbing mill, with a complete set of accessory apparatus, has recently been placed with the Westinghouse Electric & Manufacturing Company by the Imperial Steel Works of Japan. The order is the second for electrical steel mill equipment to be received by this company from the Imperial Steel Works.

The equipment is to be used with a slabbing mill with which it is expected to roll steel ingots weighing up to 25 tons, down to slabs having a maximum dimension of 17 x 46 inches and a minimum of 4 x 20 inches.





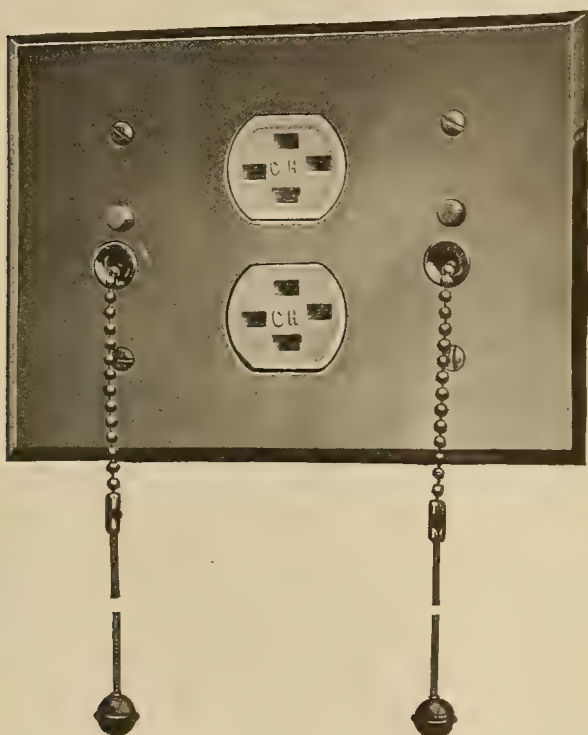
## LATEST IN EVERYTHING ELECTRICAL

(A safe and convenient call switch which will be welcomed in the hospital ward; a decidedly improved centrifugal pump, and the latest in generator sets, are described in these columns.  
—The Editor.)

### HOSPITAL CALL SWITCH WITH RECEPTACLES

A hospital call switch recently developed and put on the market by the Cutler-Hammer Manufacturing Company, of Milwaukee, has met with so great a demand that a duplex switch of this same type has also been designed. This new switch consists of two single call switches, one located on each side of a duplex receptacle with a brass plate covering all. In many cases this switch is found cheaper and more convenient than installing single switches and receptacles throughout the hospital ward.

This switch is mounted flush in the wall between beds, the patient on either side of the switch using the nearest call switch to signal the nurse. The receptacles provide



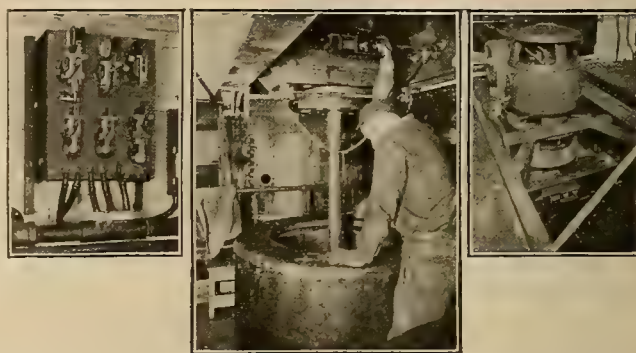
This new switchboard consists of two single call switches, one located on each side of a duplex receptacle, with a brass plate covering all.

convenient electrical outlets to plug in bed lamps, heating pads, etc. Each call switch has a pull chain with a linen cord extension, and an "off" button which protrudes through the switch plate. To call the nurse the patient gives a slight pull on the cord, which operates the signal in the utility room or at the head nurse's desk, and causes the "off" button on the switch to project farther from the plate. The signal remains in operation until the nurse or other attendant answers the call, since the only way to cancel the signal is to depress the "off" button on the switch. The protruding button also serves the purpose of indicating to the attendant which patient called.

The switch is silent in operation and contains no exposed live parts whereby the patient or attendant would be liable to electric shock. Each call switch, as well as the duplex receptacle, fits any standard wall outlet box, and may be used on any circuit of 125 volts or less. Each receptacle has a maximum rating of 250 volts, 10 amperes.

### MOTOR DRIVEN CENTRIFUGAL WITH A PUSH BUTTON CONTROL

An interesting installation of a motor driven centrifugal extractor entirely controlled by electric push buttons has recently been made at Kirkman & Sons of Brooklyn, N. Y. The centrifugal, which has a diameter of 40 inches, was built and installed by the S. S. Hepworth Company, and is direct connected through a centrifugal clutch to a 25 hp., 220-volt vertical motor, mounted on the floor above. While running at 500 r.p.m. the centrifugal is filled with 750 pounds of glycerine salts. Four minutes are required for loading and the speed is then increased to 1,000 r.p.m. for two minutes. After water has been supplied for washing the salts, the



On the right is shown a magnetic control panel for two-speed selection. On the left the driving motor is shown mounted on the floor over the extractor. The center illustration shows how, by means of a conveniently located push button station, the operator can start and stop the extractor and run it at slow or fast speed without diverting his attention from the run of salts.

centrifugal is run for two minutes more at high speed, at which time all moisture has been thrown off, the complete cycle of operation requiring between nine and ten minutes.

Four push button switches, placed convenient for the operator, allow complete and easy control of the centrifugal. Two buttons of the momentary contact type are used for stopping and running, and the other two buttons provide the slow and fast speeds—500 and 1,000 r.p.m.

The buttons open and close the circuits which actuate the magnetic contactors and relays on a special controller, manufactured by the Cutler-Hammer Manufacturing Company of Milwaukee.

Production records at the Kirkman & Sons plant, show that since this automatically controlled centrifugal has been installed, the production has been increased about 50% and only 1% of the glycerine remains in the salts, whereas with the former equipment 8% remained.

### GASOLINE ENGINE DRIVEN GENERATOR SETS

The requirements of the Army during the war brought particular emphasis to the fact that for certain work and conditions an independent portable source of power and light is indispensable. Gasoline engine driven generators of various sizes were employed extensively to great advantage.

The Allis-Chalmers Manufacturing Company of Milwaukee furnished a large number of these sets to the Government and their success in operation under exacting condi-



tions has thoroughly demonstrated their reliability as apparatus for general use.

Two sizes have recently been placed on the market: 5 kw., 110 or 220 volts, and 15 kw., 110 or 220 volts.

These sets employ four-cylinder, four-cycle gasoline engines of the automobile type which are of ample size and rating to withstand continuous full load service without being over-taxed. The engines will carry momentary overloads up to the ultimate capacity of the generator without bringing undue mechanical strain on any of the working parts. They are equipped with standard magnetos, carburetors, water circulating pumps, tubular type radiators and fans. Governors are provided which positively regulate the speed to within 4% of the set speed of the engine from no load to full load. The generators are provided with compound windings proportioned so that the voltage variations do not exceed 2% from the set voltage, from no load to full load.

The 15-kw. set, which is shown mounted on an army truck, is in some respects different in construction from the 5-kw. set. The generator is provided with front and rear bearing housings and is coupled to the engine by means of a flexible coupling. The gasoline tank is rectangular in form and is mounted in the base under the engine. The gasoline is raised to the carburetor by means of a vacuum system similar to that widely used in automobile construction. In this set the switchboard is separately mounted and may be placed in any convenient position.

## Book and Bulletins

### Bureau of Standards

The Bureau of Standards has recently published four Scientific Papers which it now offers for distribution on request.

"Thermal Expansion of Insulating Materials," by Wilmer Souder and Peter Hindert, is based upon the results of a number of thermal expansivity tests. It includes several interesting charts which show the thermal expansion of porcelain, celluloid, hard rubber, marble, and other insulating materials.

In another paper by J. H. Dellinger, entitled "Principles of Radio Transmission and Reception with Antenna and Coil Aerials," the functioning of the two principal types of radio materials is worked out quantitatively from fundamental electromagnetic theory. Experiments have verified the formulas and conclusions presented. The advantages of the condenser type of aerial, as well as the theory and nature of radiation, and the basic principles of aerial design are discussed.

Another paper, "Determination of the Output Characteristics of Electron Tube Generators," is by Lewis N. Hull, assistant physicist in the Bureau of Standards. It presents a method of analysis by means of which it is possible to design a circuit to obtain maximum output from a given tube.

Lieutenant Commander A. Hoyt Taylor, U. S. Naval Aircraft Radio Laboratory, Bureau of Standards, entitles his paper: "Variation in Direction of Propagation of Long Electromagnetic Waves." The investigation herein reported was an outcome of a study of the properties of an extremely long-wave direction finder coil, with a view to determining the feasibility of using such long-wave direction finders on large aircraft on long flights, such as a transatlantic flight.

H. D. Holler and J. M. Braham, associate chemists in the Bureau of Standards, are the authors of a Technologic Paper, No. 146, entitled "Cadmium Electrode for Storage Battery Testing."

Miscellaneous Publication No. 40 of the Bureau of Standards is the "Annual Report of the Director for 1919." In it, brief statements are made upon practically all of the special researches and lines of testing, completed or under way at the Bureau.

### Bureau of Mines

A recent report by J. M. Wadsworth, "Removal of the Lighter Hydrocarbons from Petroleum by Continuous Distillation," Bulletin 162, is written with special reference to plants in California.

The September and October, 1919, statements of "Coal Mine Fatalities in the United States," compiled by Albert H. Fay, contain statistical tables covering coal-mine fatalities during the past year.

Another recent publication by the Bureau, Bulletin 175, is the report of Van H. Manning on "Experiment Stations of the Bureau of Mines."

In cooperation with the United States Public Health Service, the Bureau of Mines has published Miner's Circular 26, "Miner's Safety and Health Almanac for 1920."

The ninth annual report by the director of the Bureau of Mines for the year ending June 30, 1919, has recently been published and is now ready for distribution.

### An Adventure in Goodwill

Significant of the new spirit in business is an interesting and unusual booklet just prepared by the Western Electric Company, entitled "A Little Adventure in Goodwill." The adventure is a new type of advertising campaign—a campaign which has as its basis not the promotion of individual interests by means of expansive displays in the daily press, but the cultivation of goodwill between the public and the electrical industry by means of a steady series of modest but effective advertisements in the high class magazines of the country. Realizing that what benefits the industry as a whole benefits the individual member of the industry, the company is subordinating its own name in these advertisements and working for the jobber, the power company, the retailer and the street railway indiscriminately.

Ten of these advertisements are presented in the booklet referred to, together with a list of the magazines in which they are to appear, and a preface address to the electrical industry.

The Western Electric Company is to be congratulated on this cooperative move, and will certainly receive the support and good wishes of other workers for electrical development.

### A Wartime Industrial Plant

"Nitrate Number One" is the title of a well-arranged and attractive booklet issued by the J. G. White Engineering Corporation of 43 Exchange Place, New York. By means of a number of photographs and a few pages of excellently printed text, it describes the building of the great government plant for the production of nitric acid for explosives, an extensive engineering feat which involved, besides the building of the actual plant, the construction of a camp for the workers, with electric light, water supply and sanitary systems, school house and dwellings, complete.

### Packing Illuminating Glassware

J. L. Wolf, secretary of the Lighting Fixture Dealers' Society of America, is issuing a series of letter bulletins on the advantages of carton packing for illuminating glassware and suggesting methods of putting this reform into operation. While these bulletins are prepared originally for confidential circulation to members of the Fixture Dealers' Society, it has been decided to send them on request to anyone interested in the improvement of fixture and lighting trade conditions. Copies can be secured from Mr. Wolf, care Builders' Exchange, Rose Building, Cleveland, Ohio.



## NEW ELECTRICAL DEVELOPMENT

(Plans for a number of new power plants are reported from the Northwest, and great activity in irrigation and in civic improvements from the Pacific Central District. Both the Pacific Southwest and the Intermountain District record new water and power undertakings, street railway extensions and bond issues.—The Editor.)

### THE PACIFIC NORTHWEST

**EVERETT, WASH.**—Plans are under way for raising funds to provide the city with a better lighting system.

**LA GRANDE, ORE.**—The Eastern Oregon Light and Power Company is planning to erect a steam plant here.

**ASTORIA, ORE.**—The realty board will ask for the extension of the Pacific Power & Light Company lines to South Astoria.

**SEATTLE, WASH.**—An appropriation of \$15,000 has been made by the city council for extension of the Ravenna street car line.

**TACOMA, WASH.**—Building returns here, January 1920, are estimated at \$211,747, as compared with \$86,728 for January, 1919.

**PORTLAND, ORE.**—Building returns here, January, 1920, are estimated at \$924,305, as compared with \$200,080 for January, 1919.

**SEATTLE, WASH.**—Building returns here, January, 1920, are estimated at \$1,291,310 as compared with \$447,195 for January, 1919.

**HARNEY VALLEY, ORE.**—The people here have voted for the creation of an irrigation district. This means the irrigation of 125,000 acres of land.

**EVERETT, WASH.**—The local traction company has notified the city council that it intends laying a double track over Broadway Trestle to provide for probable expansion of its lines.

**OREGON CITY, ORE.**—The council will probably recommend electrification of the free municipal elevator. It now has a proposal of \$5,900 but hopes to obtain a better figure.

**SEATTLE, WASH.**—Swenson & Company have been awarded the contract for an extension to the central power plant at the Navy Yard, Bremerton, to cost approximately \$50,000. This extension is to house the large compressor that will be installed.

**OLYMPIA, WASH.**—J. L. Peters reported that cluster lights for illuminating the streets would cost approximately \$150 for each stand, which would bring the cost of installing cluster lights in the down-town district to between \$20,000 and \$25,000.

**HEREFORD, ORE.**—Perry S. Burkhead and others have filed applications for permits to appropriate a storage of 12,000 acre feet of water in Hereford Irrigation District Reservoir, from the north fork of the Burnt River. A dam 70 feet high and 500 feet long is to be erected.

**SEATTLE, WASH.**—Sealed proposals will be received by Herbert T. Condon, comptroller of the University of Washington, up to noon March 16, for a single or Unabow steam engine-driven 500-hp., slow speed generating unit to be installed in the University power house. A certified check for five per cent of the bid is required.

**WENATCHEE, WASH.**—A contract has been let by Receiver R. T. Lovell of the Wenatchee Valley Gas and Electric Company for the construction of a concrete building, 40 by 60 ft. in size, adjoining the gas plant operated by the company here. This will be used to house the new steam generating station, with a capacity of 1,000 horsepower, which is expected to be in operation by April 1. The machinery for this plant has already been shipped. The total cost of the new plant will be about \$80,000.

**SEATTLE, WASH.**—M. M. O'Shaughnessy, city engineer of San Francisco, was in the Northwest recently, visiting Seattle and Tacoma. He came to the Northwest at the instance of the city council of Tacoma which had before it an application of the privately-owned railway system of that city for an increase in fares. He was called to throw such light as he could upon the subject.

**PORTLAND, ORE.**—It is rumored that the Northwestern Electric Company of this city will construct a \$5,000,000 power plant on the Lewis river in the state of Washington. The company has for some time had surveyors at work about half a mile above the Yacolt Yale bridge, built jointly by Clarke and Cowlitz counties. The big dam at the head of this canyon is to be built to hold back the flood waters of the Lewis river and used at will when needed. The electricity generated will be brought to Portland by high-power lines. It is said that the amount of power that can be generated by this water power is almost unlimited. With such a source of power, electricity can be furnished to this part of the state at a lower cost than at present. It is understood that construction work will begin this summer.

**OLYMPIA, WASH.**—Plans for the construction of the Kittitas irrigation project with preliminary estimates on cost of the work have been filed with the state reclamation board by E. M. Chandler, chief engineer for the board. Chandler offers four alternative plans, all of which provide for a permanent type of construction. The board will submit the plans to the district for consideration in determining the means of financing the project. Engineer Chandler estimates that by taking the water from the Yakima river at Easton and constructing a flume across the river at Throp to serve the territory east of Ellensburg, the total cost for the project, which would include 68,200 acres, would be \$9,808,720, or a cost per acre of \$122.79. By clearing 7500 acres of cut-over land not previously contemplated and including them in the project, the total cost estimate is increased to \$10,296,020 and the cost per acre is increased to \$150.94.

**SALEM, ORE.**—Organization of the Western States Reclamation Association at Salt Lake City in November of last year, and the subsequent meeting of the executive committee and a number of Western governors in Washington, has resulted in the compilation of much valuable data on irrigation, according to Percy A. Cupper, state engineer, and members of the executive association of the reclamation association. In Oregon a summary of the irrigation situation, together with a more extended discussion of several of the proposed projects containing public lands has been made. In this connection Mr. Cupper says this state is fortunate in that about three-fourths of the irrigated area has been carefully surveyed with regard to determination of water rights, and extensive surveys have also been made in cooperation with the United States reclamation service in the investigation of many important projects, thus making it possible to make a very close estimate of the irrigated area of the state. This area, representing only lands upon which a crop has been produced, has been estimated at 968,000 acres, according to Mr. Cupper. The total irrigable area included in the 54 irrigation projects in Oregon is about 1,000,000 acres.

### THE PACIFIC CENTRAL DISTRICT

**FRESNO, CAL.**—Notice is given that a petition will be presented to the board of directors March 1st for organization of an irrigation district in Fresno.

**COLFAX, CAL.**—The Pacific Gas and Electric Company is arranging to improve the Colfax water system, and line the reservoir supplying water to the town. The settling basin, which the company has built on Bear river, is now in operation.

**SAN FRANCISCO, CAL.**—Giving as a reason the falling condition of the bond market, the city recalled its request to banks and bonding houses for proposals for the financing of \$3,500,000 of Hetch Hetchy water bonds and \$1,500,000 of school bonds.

**STOCKTON, CAL.**—The water rights and ditches of the old Tuolumne River Water & Power Company at the head of the Calaveras river are being surveyed with the idea of constructing a dam. The project includes a large irrigation scheme.

**SAN RAFAEL, CAL.**—Manager Burt states that the Marin Municipal Water District has closed a deal with the Hawaiian Sugar Company of Crockett for 2,500,000 gallons of water daily. A 12-inch main is to be run to San Quentin and the water taken over in barges.

**SAN FRANCISCO, CAL.**—Proposed extension of the Western Pacific Railroad between San Jose and Niles and other points in the Santa Clara Valley will be decided upon at a meeting of six Pacific Coast directors of the road which will be held in San Francisco soon.

**MARYSVILLE, CAL.**—The Marysville and Nevada Power and Water Company has given notice that the principal place of business of the corporation will on March 9 be changed from Marysville to San Francisco, according to a decision reached by the board of directors of the company.

**SAN FRANCISCO, CAL.**—The Sierra & San Francisco Power Company has been granted 150 cubic feet per second from the south fork of the Stanislaus river for power purposes. A ditch, flume and concrete dam comprise diversion works. The amount of power to be developed is estimated at 57,272 t.h.p.

**RED BLUFF, CAL.**—State Engineer W. F. McClure is authority for the statement that the survey now under way by the State and Reclamation Service has developed glowing hopes that a suitable site for the dam of the proposed Iron Canyon Irrigation project will be found near Paynes Creek, on the Sacramento river.

**HONCUT, CAL.**—The Honcut-Yuba irrigation district has made application to the State Water Commission for 100,000 acre feet per annum from North Honcut, South Honcut and Wyandotte creeks, for irrigation of 30,000 acres. The water is to be diverted over an earth dam 100 feet high, 600 feet long on top and 100 feet long at bottom.

**INDEPENDENCE, CAL.**—The State Water Commission has granted the Independence Mining and Milling Company 12½ cubic feet per second from Little Pine Creek, Inyo county, for power purposes. The diversion works consist of main pipe line and a concrete dam 7½ feet high. The total amount of power to be developed is estimated at 471.6 t.h.p.

**WESTWOOD, CAL.**—The Red River Lumber Company plans to establish a construction camp on Clear Creek, near here, and to build a dam across Feather river.



**BAKERSFIELD, CAL.**—At a meeting of the stockholders of the Oildale Mutual Water Company it was voted to purchase the property of the Oildale Water Company at the price of \$5,000. It will be necessary to raise about \$12,500. This amount, it has been stated, will be sufficient to fully develop the plant to improve it.

**EUREKA, CAL.**—The Eureka division of the Western States Gas and Electric Company has received an application for 2,000 kilowatts connected load for the Pacific Lumber Company for logging purposes. Figures compiled by other logging companies which operate electrically show that the electric donkey makes a saving of 55 cents per 1,000 feet board measure of timber logged.

**SAN FRANCISCO, CAL.**—Suit for \$411,835 has been filed in the Superior Court by the Engels Copper Mining Company against the Great Western Power Company. The mining company says it lost \$300,000 by the negligence of the power company that permitted breaks in service that should have been continuous. The rest of the sum asked is listed as overcharges for service.

**OAKDALE, CAL.**—The Utica Mining Company and the Sierra & San Francisco Power Company, meeting the objection of the irrigation districts that they wanted to own whatever reservoirs they needed in the mountains, have offered to turn over to the Oakdale and South San Joaquin irrigation districts their reservoir sites and to buy from the district whatever water they store.

**SACRAMENTO, CAL.**—The South Feather Land & Water Company has made application to the State Water Commission for 50,000 acre feet per annum from South Fork Feather river, for agricultural purposes on approximately 30,000 acres. Water will be diverted by means of canal and pipe line, and concrete dam 20 feet high, 110 feet long on top and 80 feet long at bottom. Estimated cost, \$1,000,000.

**SAN FRANCISCO, CAL.**—The San Francisco, Napa and Calistoga Railway has applied to the Railroad Commission for a permit to install a single track standard gauge electric railway at grade across Nebraska and Mississippi streets, Vallejo. The line is to be used for the transportation of freight to and from Mare Island Navy Yard. It is to be connected with the Southern Pacific near Napa Junction.

**FRESNO, CAL.**—Thomas J. Ryan, a New York financier, has authorized the announcement that from \$3,000,000 to \$5,000,000 of Eastern capital will be raised soon for the exploitation of the natural resources of the Tulare Lake region. Mr. Ryan made his announcement following a three-day tour of the San Joaquin valley, in which he gathered considerable data on the possibilities of the rich lake territory.

**FRESNO, CAL.**—Plans for the new office building and garage which is to be erected by the San Joaquin Light and Power Corporation were filed with James Anton, city building inspector. The building is to stand at the corner of Tulare and First streets, and will occupy a ground space 225 by 133 feet. The cost of the building, according to the estimates of the architects, and the permit issued by the city inspector, will be \$80,000.

**MODESTO, CAL.**—By a vote of approximately ten to one, the voters of the Modesto irrigation district, at an election, upheld the issuance of \$2,000,000 in bonds for the carrying out of the Don Pedro project. Recently the Turlock irrigation district voted \$4,000,000 to finance their part of the improvement. The \$6,000,000 voted by the two districts will be used for the construction of a dam and reservoir and for the development of electrical power at the dam.

**RICHMOND, CAL.**—Details are being closed for the starting of work early this spring upon three of the most important public improvements undertaken in several years. They are the improvement of the Macdonald avenue sub-

way, the construction of a viaduct under the land branch of the Santa Fe at Sixth street, and the East Side storm sewer. The viaduct will cost \$30,000. It is likely that Tenth street will be paved with a concrete base paving at the same time.

**SACRAMENTO, CAL.**—The State Water Commission has received application from the Excelsior Water & Mining Company for 60,000 acre feet to be impounded in Madola reservoir, of waters of Deer Creek, Nevada county, tributary to Yuba river, for irrigation of 22,000 acres. Water is to be diverted through main canals 24 miles long. The diversion dam has already been constructed. Estimated cost, \$1,900,000. Applicant allowed 60 days from January 9, 1920, to complete application.

**SAN FRANCISCO, CAL.**—The Western States Gas and Electric Company, which operates in the counties of San Joaquin, Humboldt, Trinity, Sacramento, Calaveras, Amador, El Dorado and Contra Costa, asked the Railroad Commission for authority to issue preferred stock of the par value of \$603,000. The proceeds of the issue, according to the application, are to reimburse the company's treasury for moneys paid into the sinking fund and for the purpose of obtaining funds to enable the company to partly carry out construction plans for 1920.

**COLUSA, CAL.**—D. P. Doak, president of the Colusa Delta Lands Company, announces that plans will soon be perfected for improvement of the tract which will cost in the neighborhood of \$200,000. "The chief improvement will be the digging of two great ditches, one on either side of the tract," said Mr. Doak. "These will supply the entire 25,000 acres with an abundance of water. The old ditches are not in good condition and are not large enough for the work. The company plans to erect a fine reinforcement concrete pumping plant in the Princeton section."

**FRESNO, CAL.**—The San Joaquin Light and Power Corporation will soon build another 15,000-horsepower natural gas burning steam generating plant in Kern county oil fields. The new plant will cost approximately \$1,000,000 and will be located in the center of the new natural gas field so as to make use of the large amount of natural gas recently discovered and at present unmarketable. The company at the present time is installing a 17,500-horsepower addition to its steam plant in Bakersfield, which will make an addition to its generating capacity of 35,000 horsepower in steam plants in Kern county alone. This new oil field steam plant promises to become the greatest natural gas burning steam electric generating plant in the country.

### THE PACIFIC SOUTHWEST

**LOS ANGELES, CAL.**—Plans for the extension of the Temple car line to Hollywood are under consideration by the Northwest Business Men's and Property Owners' Association.

**YUMA, ARIZ.**—O. H. Ellis, of Blythe, has been awarded a \$60,000 contract for the extension of a canal system to be installed in lands recently released by the Government in the Colorado River Indian Reservation. 6,000 acres will be irrigated.

**LOS ANGELES, CAL.**—Continued dry weather causes unprecedented demand for electric power for irrigation purposes in southern and central California. Central stations take advantage of fair weather to overhaul plants, since a great load is expected this summer.

**LOS ANGELES, CAL.**—This city has filed an application with the State Water Commission for 14,500 acre feet per annum from Rock Creek, Inyo county, for power purposes. The amount of power to be developed is estimated at 6,790 t.h.p. The diversion works consist of a storage reservoir. The estimated cost of the proposed works is \$350,000.

**LOS ANGELES, CAL.**—An order by the Railroad Commission recently authorized the Southern California Edison Company to issue 50,000 shares (\$5,000,000) of its common capital stock, the proceeds to be held subject to orders by the Commission. The Commission also authorized the company to issue 3,000 shares of stock to its employees under terms that have been approved by the Commission.

**LOS ANGELES, CAL.**—Application has been made to the State Water Commission for 250 cubic feet per second from the south fork of the Kern river, for power purposes. The amount of power to be developed is estimated at 45,000 t.h.p. and 25,000 acre feet of water will be stored. The diversion works consist of conduit, tunnel and pipe lines, 13½ mi. long, and a timber crib or earth fill dam 20 feet high. The estimated cost is \$3,000,000.

**LOS ANGELES, CAL.**—Because of the lowering of water levels due to the dry year, and the subsequent increase in the cost of pumping water, the Claremont Domestic Water Company of Los Angeles county has asked the Railroad Commission for authority to establish a higher rate schedule. The company also claims that its profits have been diminished by added labor, materials and cost. The company wants to increase rates for irrigation from three cents per miner's inch to four cents and to increase its present minimum rate of \$1.25 to \$1.50.

### THE INTER-MOUNTAIN DISTRICT

**KELLOGG, IDA.**—Plans are now under way for the extension of the Washington Water Power Company's electric line to Eagle Creek district from the Murray section on the north side.

**KAMAS, UTAH.**—In a petition filed with the Public Utilities Commission recently the Kamas Light, Heat & Power Company asks permission to increase its charges for electric lighting. No decision has been rendered by the Commission as yet.

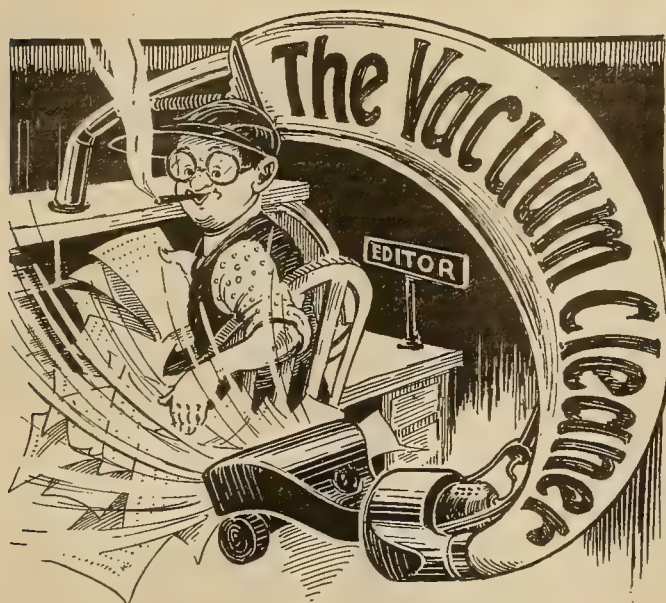
**SALT LAKE CITY, UTAH.**—Street car employees of the Utah Light & Traction Company have decided to withdraw their petition for a consideration of their present wage scale until the expiration of the present working agreement with the company, which will be May 1.

**SALT LAKE CITY, UTAH.**—B. E. Rowley, for some time past local manager of the Edison Electric Appliance Company here, has been appointed Rocky Mountain district manager for that company and will have charge of the company's activities in the states of Utah, Colorado, Montana, Idaho and part of Nevada. Mr. Rowley is very well known among electrical men of the West.

**SALT LAKE CITY, UTAH.**—J. R. Murdock of Heber City, Utah, has filed application with the State Engineer for permission to use one hundred second feet of water from Utah Lake to irrigate approximately thirty thousand acres of land in Utah county. While the petition is filed in Mr. Murdock's name, it is understood that the Utah Lake Irrigation Company will later take charge of the project. Electricity will be used exclusively for pumping the water onto the higher land.

**SALT LAKE CITY, UTAH.**—Local electrical interests, including contractor-dealers, jobbers, central stations and manufacturers' representatives, are actively considering the formation of a cooperative association to cover the states of Utah and Idaho. Several meetings have been held to consider the matter and an advisory committee has now been appointed to work out the details of organization. The association will probably be known as the Utah-Idaho Electrical Cooperative Association. Local newspapers are keenly interested in the plan and two of them have already established electrical departments in which they will feature the many ways in which electricity can lighten the burdens of the housewife.





Truthful advertising surely has no more touchingly frank an example than this, appearing in a Russian paper: "The reason why I have heretofore been able to sell my goods so much lower than anybody else is that I am a bachelor and do not need to make a profit for the maintenance of a wife and children. It is now my duty to inform the public that this advantage will shortly be withdrawn from them, as I am about to be married. They will therefore do well to make their purchases at once at the old rate."

\* \* \*

#### ODE TO A FLIVVER

By Richard E. Smith

Spirit of mischief incarnate,  
At last thy foul heart is still;  
Leaving me here, despondent,  
At the foot of a winding hill.

'Twas not for love I caressed thee  
And nursed dying embers of life;  
I had hoped to get home before daybreak  
To allay anxious fears of my wife.

What imbecile genius conceived thee?  
What demon awaited thy birth?  
What prophet of evil ordained thee?  
What siren proclaimed thy false worth?

Cursed be the day that first saw thee;  
Thrice cursed the day that we met!  
Thy passing arouses no anguish—  
Thy interment will cause no regret.

#### L'ENVOI

Once more I'll fix the timer,  
Then maybe we can climb 'er.

\* \* \*

A new proposal is to have editors licensed in the same way that engineers and doctors are licensed—on the theory, presumably, that while bad engineers and bad doctors endanger our lives, bad editors endanger our immortal souls. We have always known that the pen is mightier than the scalpel, of course, but we hardly expected it to be so generally recognized. However, if anybody passes a law that subjects our editorial eloquence to the approval of a licensing board, we shall retaliate by printing nothing but highly improving texts on this page, and perhaps a little poem or two; for instance:

Be good, lineman, and let who will be clever;  
Do noble jobs, not dream them all day long.

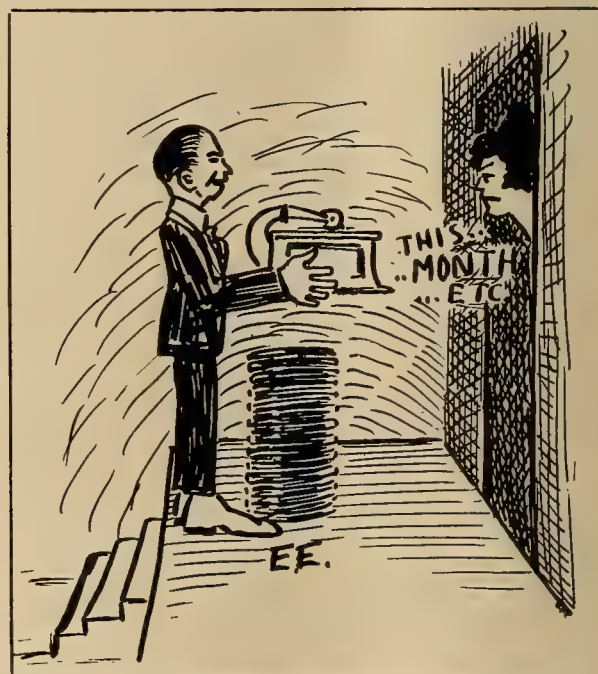
We've forgotten the rest for the moment, but we can write lots more:

How doth the little water wheel  
Improve each shining hour?  
By making amperes all the day  
To fill the world with power.

The love of a label is a very deeply rooted characteristic of the ordinary human, according to a prominent Middle Western manufacturer. On the door of this magnate is painted in gold letters the legend "Office Boy," the reason being given by himself as follows: "Bill Smith is a fine clerk. He has been caring for the routing of our shipments, looking after freight claims and keeping our fleet of motor trucks for freight yard and short-haul stuff right up to snuff. I pay him well, but he thinks he ought to get more money and a title. I compromise on the title, for this is what he really wants, and after all costs me less, so now he is General Traffic Manager.

"By the time I had created General Advertising Managers, General Managers of Factory Costs, General Purchasing Agents, and a drove more, I ran out of titles, and as I felt it undignified to go without any title at all, I took what was left. You know every magazine tells how the office boy rose to affluence and position by first saving the paper and string which came around the packages delivered to his boss. Well, I'm still saving the paper and stringing a little yet, so I take the title which by all standards should bring me to affluence and prosperity. So, I'm the office boy."

\* \* \*



#### HELPFUL HINTS FOR THE METER MAN

For the meter man who is exhausted and speechless after explaining to three thousand four hundred and seventy-two irate housewives why the electric light bill is what it is and is not what it is not, this little device is suggested by a member of the Society for the Preservation of Meter Men. The meter man should have a little Ford for the transportation of this equipment, and when the housewife begins asking questions he selects the proper record and stands by with a conciliatory expression.

\* \* \*

To collectors of the series entitled "Foolish Question Number 999" we offer the following:

John Helferwork, Happy Hawkins' hired man, was standing in front of Einstein's door as a funeral procession went by.

"Whose funeral?" he asked of Einstein.

"Chon Schmidt's," replied Einstein.

"John Smith!" exclaimed Happy's man. "You don't mean to say John Smith's dead?"

"Vell, by golly," said Einstein, "vot you dink dey doing mit him—bractising?"



IN THIS ISSUE: Electrical Contracting as the West Sees It

# JOURNAL OF ELECTRICITY

VOL. 44 NO. 6

SAN FRANCISCO, MARCH 15, 1920

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## LOCOMOTIVE ELECTRIC WASHER

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# JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

VOLUME 44

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NUMBER 6

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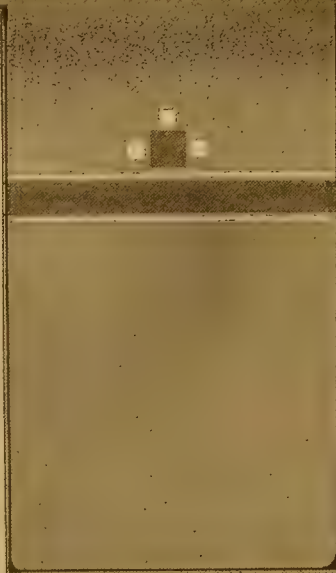
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"You're the only one figuring this."  
"Thanks, yessir."



"I'm all mixed up."



"Holy Moses, we left out the labor!"



"Aw, Jack, gimme a preference."  
*(Slips them roll of bills.)*



"Peddle? What do you mean? Peddle?"

THE ELECTRICAL CONTRACTOR-DEALER of the West has made another contribution to electrical progress in this clever burlesquing of his problems. The high principles of business established by this branch of the industry are laying a foundation of sympathy and cooperation on the part of electrical interests and the public alike.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, MARCH 15, 1920

Number 6

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## HOOVER AND POLITICS

Long have engineers discussed in a more or less informal manner the keen necessity of the engineering profession participating in a more effective manner in great public problems of the day. Never has there arisen in our national life a greater call for the active enlistment of citizenship in helping to solve the vast industrial and economic problems ahead than that which confronts the nation today.

Let us for a moment review some of these problems. First and foremost come the problems of transportation both on land and sea—that of the solving of our railway difficulties and of the merchant marine. Indissolubly connected with these two problems are those of labor and capital in the wake of which must always follow the problem of financing which today, due to the depleted store of the world's supply of moneys, must each day become more and more acute.

It is difficult for us to look about and find embodied in a single personage one who has the distinct characteristics for the office of Chief Executive to a higher degree than has Herbert Hoover. Indeed, it is questionable if in all history there has appeared a man so modest in presumption and yet at the same time so fitted for this great and important need of the hour. No more vital problem arises in industry than the economic supply of raw materials. As one who has participated in the production of metals, it is doubtful if there has ever been one so conversant on a broad international scale in the mining engineering profession and in the economic production of metals as is Herbert Hoover. In regard to food supplies, both at home, in foreign countries and in the enemy countries of Europe, he occupies a peculiar and sympathetic place in the hearts and minds of these peoples, while immediately upon cessation of military operations in Europe he became the railway

administrator and executive of a vast system of railways throughout Europe in both friendly and enemy countries—a position marking him as unique in the annals of railway rehabilitation. Today the United States of America is the greatest industrial corporation in the world. There is need of having in our Chief Executive a man well familiar with the practice of handling great units of industrial activity and one who possesses a sound, sane business judgment.

While Herbert Hoover has made it well evident to all that no one today is authorized to speak for him, it is clear from his recent utterances that he is opposed to socialism, that he believes in private ownership, that he believes in the development of individual stimulus, and that above all he is a broad, sympathetic American in his viewpoint both to his own country and to the world at large.

Engineers today throughout the nation, after reviewing the peculiar fitness of this man Hoover for the office of Chief Executive, are answering by the thousands the call to service in enlistments of supporters from every quarter in behalf of his election to the Presidency of the United States of America, not because Herbert Hoover happens to be an engineer but because they see in him the man of the hour for this position. Six weeks ago the Journal of Electricity, by frontispiece and leading editorial, came out in no uncertain words in endorsement of Herbert Hoover for President. From practically every quarter of the West has come a unanimous endorsement of this action. To his election to the Presidency of the United States of America, this journal shall devote its activities during the coming months, and we bespeak a cordial and friendly greeting in his behalf throughout the vast Empire of the West and ask our citizens that his name be given the most careful and earnest consideration.

Frequently is heard the statement, usually from an insulator manufacturer, that the insulator problem is solved; that all former designs are to be junked. In such instances stress is laid on design. To be sure there have been great strides taken in design improvements, both electrically and mechanically—but, to the operating engineer, a **good** insulator means only one thing: an insulator which will last under the intended service.

A recently concluded megger test of eleven thousand suspension units, in service on a high voltage line, disclosed only three bad units—this after

something over two years' service. It is admitted that neither the test by megger nor the results of only two years' service are decisive in themselves, yet other evidence which is available seems to add the weight of certainty to the conclusion that the answer to the insulator problem is known. These additional facts are that these particular insulators were of one standard, while others of equal length and condition of service but manufactured by a dif-

Christopher Columbus got there after many trials—do not let anything interfere with your getting to convention —

PASADENA — MAY 17-21, 1920



ferent (if not lower) standard, did not give nearly as good results under the same test. Attention is drawn to the use of the term **lower standard**. In the two cases the same specifications were given the manufacturers, the same factory tests were applied, and the same field handling given; yet there was a known difference in the product.

The answer is simple: plain, ordinary, honest work in the factory can produce suspension insulators as reliable and satisfactory as the smaller and better standardized pin types. Insulators as taken from the kiln can be visually inspected, can be given all the usual electrical tests and yet be poor insulators, due to porosity or granulation. This may be discovered by breaking the insulators and examining the internal structure; or by an intimate knowledge of the history of the batch from the time of mixing to removal from the kiln, in addition to the surface appearance after glazing.

Generally, the only problem involved is the selection of the proper material as it comes from the kiln. The processing of the material before it is fired is important, but it can be controlled and the range of suitability is quite wide. Uniformity of firing, however, is impossible, and since a kiln will contain a product of a wide range of vitrification, the question of insulator manufacture will depend upon the reliability of selection of the desirable units to place on the market.

Periodically the discovery of some new form of energy which will "revolutionize" the industry of the world is heralded by the easy-believing American press. Usually the newspapers proclaim in "scare heads" the achievement of some unknown investigator, who has "stumbled upon" reservoirs of power hitherto unguessed of by science. Reminiscent of the generous publicity accorded during the war to ill-fated Garabed, are the recent newspaper accounts of a new method of obtaining electrical energy claimed as the discovery of a nineteen-year-old Seattle youth, Alfred M. Hubbard. The device purported "to capture the illimitable power of the universe," as the fervid journalistic diction put it; and it has, according to its originator, no moving parts connected with it nor any batteries, storage or primary. Under plea that his patent rights might be infringed, the youthful experimenter has been averse to close examination of the contrivance by qualified electrical engineers.

Whether or not this "Atmosphere Power Generator" will prove as little founded on sound scientific principles as Garabed, it behooves the daily press to be conservative in its pronouncements. Newspapers have a definite duty to the public in industrial affairs, no less than to industrial interests which are themselves mainstays of the press. Frequent announcements of "revolutionary" power-generating devices are not conducive to public confidence in the securities of electrical industries; and it would be well for the daily journals to investigate fully, as the technical press seeks always to do, before giving

wide publicity to matter which may affect unfavorably the interests of important elements in our industrial life.

According to the Seattle "Post-Intelligencer," Hubbard says his generator "will junk every steam and gas engine in the world; it will place electricity in every home without cost for current; it will do away with all the present cumbersome methods of electrical production with their generators, transformers and transmission lines." What is the effect of columns of such claims placed in alluring fashion before the public eye? If they are reiterated often, the confidence of the investor in stocks and bonds of electrical corporations is bound to be shaken. The insidious suggestion, oft-repeated, that after all some new method may come along and suddenly sweep away the fabric which the electrical industry has been years upbuilding, is likely to sway the judgment of many a man who may have money to invest.

So, we say, enough of this talk of mysterious new power principles "making necessary the scrapping of enormous values in present-day power machines, wiping out industries that have every evidence of permanency"—to quote a recent editorial utterance on this latest device. Let proper investigation first be made by qualified specialists before announcement is made broadcast of such extravagant claims. Thousands will laugh, and will not take them seriously; yet thousands unquestionably will—and the newspapers must accord due protection to important industries whose progress forms part of the common prosperity, their own included.

The various shipbuilding accomplishments of the last two years on the Pacific Coast, wherein the best of Eastern achievements were outdone, have called attention to this section of the country as a possibility for this line of enterprise. It is gratifying to note, too, that the eyes of the commercial world are more and more being directed to the Pan-Pacific area and the possibilities of Pacific Coast cities in commercial development of the future. It is, as a consequence, with an unusual sense of satisfaction that we view the activities that are at present looking to the deepening of Western harbors for increasing future shipping facilities. It has developed in recent months that the entrance to San Francisco Bay in natural depth of channel is exceeded by only one other harbor in the United States—that of York, Virginia. It is true that New York harbor and Norfolk and one or two others are today of greater depth. However, this depth has been acquired by artificial means. The depth of the channel under all conditions through the Golden Gate is something in the neighborhood of thirty feet. That the depth of this harbor should be artificially constructed to carry 40 ft. clearance is a question that should receive the careful consideration and attention of Congress at an early date. Possessing already, by nature, the second best depth of harbor in the country, artificial



deepening seems justified and advisable from every viewpoint. It is to be hoped, then, that considerable interest will be aroused in undertakings of this nature so that the great port facilities of the West may be presented to the commercial world at large without a peer in the enterprise of the world.

The immense value of auxiliary steam plants to power companies, even in a country with great water power resources, is now being exemplified in the West. Not only has the present year so far proved very dry, with only light rainfall over most of the district beyond the Rockies, but the past three winter seasons have been little better. In California, for instance, until quite recently all the Sierra streams were low; the Stanislaus river, for example, is reported to have been lower than ever in its recorded history. The recent rains will do much to help the power situation, yet the stores of water in most of the reservoirs are much depleted, and the power companies have turned to their steam plants to keep the generation of power up to the required amount. Normally these plants produce about one-quarter of all electric power used in California; but at the end of November they were said to be turning out fully one-half of the total current generated. Many of the steam plants were being forced, with a consequent wastage of fuel and an increased cost of production.

No doubt is expressed as to the adequacy of the precipitation in California and the West this year to serve the needs of the hydroelectric stations. The wet season is later than usual, but this is not necessarily an indication of a dry year. Nevertheless, power companies are paying proper attention to the development of their steam plant equipment, in order to keep pace with the increasing demands of Western homes and industries, which must be permanently assured of dependable service.

Several of the states have issued, or are preparing to issue, new industrial lighting safety codes, indicating an awakening of interest in proper factory illumination all over the country. California has recently put into effect an up-to-date code which is being pointed to as a model in many features. While it will undoubtedly result in a quite general readjustment of industrial lighting arrangements, it is unlikely that it will work hardship on building owners or employers, as the orders only require the minimum intensities. The restrictions as to glare and the distribution of light aim to protect workers to a reasonable extent. Of course, a much greater amount of light than that provided for would be necessary to insure maximum production, but nevertheless a raised general standard of illumination and a perceptible increase in manufacturing efficiency should soon be apparent. Good lighting, as a recent survey of industrials in Chicago showed, increases production approximately 15%, at an added cost of but 1% to 6% of merely the labor cost.

The excellent manner in which the California Code has been drawn bespeaks for it the earnest consideration and attention of all well-wishers of the industry.

The subject of hotel rates is one of the greatest delicacy. In the West where hotels have done such wonderful things in advertising the resources and possibilities of this vast district, little criticism has in former years been heard relative to the rates charged Eastern visitors. It has been called to the attention of the Journal of Electricity that this season is experiencing unusual numbers of visitors from the East. The consequence is that hotels, both far and near, are loaded to the limit. In some localities, even the lobbies are being made use of to accommodate those who are not fortunate enough to secure night lodging upon arrival in the various cities of the West. It is difficult to foresee such a situation as this, so there is little to blame due to the fact that hotel accommodations are insufficient to take care of the great demands that are being made upon them in the various sections of the West. There is, however, a grave responsibility that rests upon all to see to it that these Eastern visitors and tourists be given a square deal and reasonable attention to carry them through the present critical and over-crowded situation. That some of the hotels in well-known tourist districts are this year charging exorbitant and unheard-of prices is a subject of serious public concern and it would be well that men of the electrical industry, both far and near, protest with no uncertain emphasis against the undue charges that are being made in instances where hotels have become overcrowded. It is hard indeed to pen these lines in criticism against certain of our hotels that have done such wonderful things in the past to set forth the wonders and possibilities of the great undeveloped West. And yet, for permanent growth of this section, we must see to it that a square deal and fair play be the fundamental principles upon which the growth of the West must continue.

At the present time with most of the power companies applying to the Public Service Commissions for permission to increase rates due to the increased cost of production, the question of present day valuation of physical properties comes again into the limelight. If the electrical industry is to be developed to its utmost and large amounts of money spent in new construction, then it is only just to allow a fair return on the money thus spent. Many well-known authorities on rate fixing agree that the present value of a concern is the value of all its property, tangible and intangible at the time of the investigation. If the

It is important to remember your wife's birthday—but there is nothing more important to the electrical industry of the West than this year's conventions —

PASADENA — MAY 17-21, 1920



costs of labor and material are higher at the time of the inquiry than those prevailing at the time the property was constructed the reproduction cost would be greater and consequently the value of its tangible properties would be proportionally higher. Any other position would result in taking the property of the utility without just compensation because the purchasing power of each dollar of its net return would have decreased in the same ratio that labor and material had increased. So the same values that would hold in a condemnation proceeding against a utility should be allowed in a case where the value of that utility is to be used in the determination of the rates it is to be allowed to charge. There is no doubt that the present system is unwieldy.

Fluctuating prices are to be anticipated for years to come. On another page of this issue C. E. Grunsky has offered an interesting analysis that merits the attention of executives of utilities and those who sit upon the benches at commission hearings.

While it may be taking too big a step all at once to allow a rate on present installations agreeable to present day costs, still each day brings more forcefully to mind that reproduction of installation is actually taking place and perforce at the present high prices. Hence it must readily be acknowledged, whether we like it or not, that if these prices continue over a period of from ten to fifteen years, complete replacement will have been undergone and then the situation will have to be admitted.

"If you have a dollar and I have a dollar, and we trade dollars, we each still have a dollar. But if you have an idea and I have an idea and we trade ideas, we each have two ideas." That statement applies with the greatest force to the meetings and conventions of the American Institute of Electrical Engineers. That organization does not exist for the members to meet for the purpose of making money from each other, or from outside persons or organizations, but it has for its purpose the transference of knowledge.

When prospective members are acquainted with this fact and the employers of members more fully appreciate it, greater good will come from the Institute. As knowledge is power, that employer who sees to it that his employes have the fullest opportunity to acquire knowledge, will progress. And those engineers—and potential engineers—who see that the greatest advancement to themselves comes through knowledge, will hasten to promote the welfare of the Institute.

The meeting of the Conference Club which was held in New York two or three weeks ago was an event of importance for the electrical industry in all parts of the United States. The idea was there formulated for the extending of the scope of this Conference Club, hitherto a discussion ground merely for the contractor-dealer, to a forum for the entire electrical industry, where representatives from every branch and from every part of the country may discuss matters of public policy and intergroup relationships. It is the intention that this shall be an advisory rather than a directing body—merely a place for clarifying thought in the interest, first, of the public; next of the industry as a whole; third of the various branches of the industry as entities, and finally, in the interest of the companies of the individuals engaged in this business.

This tendency toward cooperation which has become such an intrinsic part of the electrical industry is the strongest element in its present position. From the inception of the various movements—the Goodwin Plan as a national idea, and the California Electrical Cooperative Campaign as a practical working unit—the cooperative idea has grown and has strengthened the industry within itself and greatly bettered its relationships with the public. The present organization is a recognition that straight thinking solves most ills. The movement is one of the utmost significance to the electrical industry and one in which, although it centers on the other side of the continent, the West should make the effort to bear an active part.

## INDUSTRIAL USES OF ELECTRICITY ON THE PACIFIC COAST

—A collection of articles bringing out the development of Western industry and the consequent advances in the use of electricity

## WESTERN RAILWAY ELECTRIFICATION

—Presenting the most recent progress on the Chicago, Milwaukee & St. Paul Railroad in the electrification of the coast section.

## TELEPHONING FROM THE AIR

—By Roy J. Heffner. An authoritative article on radio telephone equipment as developed for aeroplanes during the war.

## MAKING A SUCCESS OF ELECTRICAL RETAILING

—Some of the merchandising features of a progressive electrical establishment on the Pacific Coast, and the ways in which they promote successful business.



# Electrical Contracting 500 B. C.

BY L. R. ARDOUIN

(This play was originally produced by prominent electrical contractor-dealers at a meeting of the San Francisco Electrical Development League under the title "Take the Offmug Apartments F'rinstance, or 500 B.C." As an entertaining but forceful burlesque of cut-throat contracting, it is significant of the new spirit of integrity which is arising in industrial circles.—The Editor.)

## ORIGINAL CAST

U. Goatell, Architect.....C. J. NEWBERY  
I. Skinnem, General Contractor.....C. F. BUTTE  
U. Soakem, Skinnem's partner.....C. B. KENNEY  
Slashem Beatem, Electrical Contractor.....C. L. CHAMBLIN  
Cuttem Sharp, same species.....E. E. BROWNE  
Hackem Slick, another criminal.....PERCY SCHWARTZ

## SCENE I

### The Architect's Office

[U. Goatell is seen at table poring over plans. Skinnem enters.]

Skinnem: Hello!

Goatell: Hello!

Skinnem: What's new? Got anything on the boards?

Goatell: Yeh, just finishing a plan for the Offmug Apartments on Punk Street. Some job!



"Let's see where we made the mistake that gave us the job."

Skinnem: How's chances to figure them?

Goatell: Fine, if you give me a decent figure. I really believe that you made a profit on that last job—that Goofle residence.

Skinnem: Well, I admit I made two dollars a day and worked myself. But you can't call that unfair.

Goatell: Now, lissen. We won't talk about that. I want you to figure this right. You gotta give me a decent figure or you don't figure any more plans in this office. Just to show you that I'm a good sport, I'll give these plans only to you. I have only one set. These are the originals. If you'll give me a right price, we'll go right ahead with the job.

Skinnem: Yessir. [Exit.]

[After Skinnem goes out, the Architect calls up general contractors and tells them to come in for plans, that they are the only ones on the job, and so on.]

## SCENE 2

### Office of Skinnem and Soakum

[Soakem seen seated at desk, smoking; feet upon desk. Enter Skinnem in a hustle.]

Skinnem: Got a job, got a job! We're the only ones figuring it. Here's where I get back at that U. Goatell for being so strict on that Goofle residence. I actually had to put in everything the plans and specifications called for, on that job.

[Soakum is not perturbed. Raises his eyebrows.]

Skinnem: Well, let's get down to business. He wants that figure in by tomorrow at 12 o'clock.

Soakum: All right, where'll we start?

Skinnem: Let's figure the extras first.

Soakum: Now listen, my son. Haven't I taught you what a general contractor should know? He is supposed to know a lot. Supposed to, get me? It's the simplest thing in the world, to figure a job. All you gotta do is get the bids from the material men and sub-contractors, put them in columns tabulated, add 'em up correctly, and put on something for labor and maybe profit, and then watch the other contractors and try to get a line on their bids. It's the same all the way down the line with the contractors.

Skinnem: Well, we're the only one on this job.

Soakum: Yes, I know; but we gotta watch out just the same.

Skinnem: Well, I'll lay out the carpenter work, and the bricklaying. That's all I know how to do. You go ahead and rustle up some of these sub-contractors.

Soakum: I think I'll start on the Electrical Contractors first.

[Soakum proceeds to call up several electrical contractors: "Gimme a good price, now. None of that high-faluting stuff." Soakum goes on with the usual "line." Then the two have a good time telling each other "what fools these sub-contractors be."]

## SCENE 3

### Street Scene

[Cuttem and Slashem enter and meet. They are very, very cordial.]

Slashem: Hello, Cuttem.

Cuttem: Hello, Slashem.

[Usual line of preliminaries.]

Cuttem: Hear you got the Dingbat residence. Betcha didn't get 25 and 20.

Slashem: Sure I did, but I threw in the fixtures.

Cuttem: Well, I stayed off that job for you. Now I want you to do me a favor.

Slashem: Sure, you know me.

Cuttem: Yeh, I know you too doggone well. Well, what I was talking about was this: there is a job out here on Punk Street—apartments out of Goatell's office. Now you know I have the inside there. He never lets any of his work to anyone but me. He used to flirt with my wife, and we have known each other for years. We're old pals. Why, yesterday he says to me, "Ike, you're a wonderfellow; I wouldn't have any of those cheap skimmers around my office like Bunk." Now this contractor, I do all his work, see? So, if they ask you for a figure, bid high and I'll buy you a nice cigar.

Slashem: Sure. [Cuttem goes out.]

[Hackem enters and exchanges greetings with Slashem. Extremely friendly.]

The small boy who puts a board in his trousers is prepared for emergencies—are you prepared for the visitors who will visit the coast after convention?

PASADENA — MAY 17-21, 1920



Slashem: How's business?

Hackem: Rotten. I'm all mixed up.

Slashem: What's the matter?

Hackem: I can't tell how much I've made. Don't know where I'm going to; bills coming in, and I have to scramble to meet the payroll.

Slashem: Don't you keep any books?

Hackem: No, what's the use? I'd only have to employ some one to take care of 'em. I haven't got time to take care of them myself. I got enough to do—sweep out the place in the morning, get the men started, answer the telephone, take material out on the job, put in forty or fifty outlets a day during my spare time. Whaddy think I'm in business for? I can't be bothered with spending money for a bookkeeper's salary. I got enough expenses. Keeping books adds to the cost of my jobs and cuts down my profits. Keeping books is an expensive luxury. Ask any general contractor, if you don't believe me. When I got more money in the bank this time next year than I have this year, I know I've made money. Isn't that enough? This year I had \$1500 more on January 1st than I had on January 1st last year.

Slashem: Yeh, but your rich uncle died and left you five thou in the middle of last year.

Hackem: Sure, and I have another that will probably drop off next year. Well, I gotta hurry along. I'll make some profit somehow. But I am not going to let any of these birds take a job away from me, even if I have to do it for nothing. But you're my friend. I want to thank you for staying off that last job for me. I made five per cent gross on that. Some profit!

Slashem: Oh, that's all right, you needn't thank me. I want you to stay off one for me now, will you?

Hackem: It depends. What is it?

Slashem: The Offmug Apartments, out of Goatell's office.

Hackem: Ask me something easy. I have the plans in my office right now.

Slashem: Yes, but you haven't got a chance. I'll get that job \$100 preference over you. I am the only one in, in that office. You oughta know that. Goatell lets me meet every figure.

Hackem: Well, I hate to lay off after I've spent all this time figuring on it. Tell you what I'll do. I'll play you a game of poker for it.

Slashem [deeply offended]: Where do you get that stuff? Well, you'll want me to do something for you some day.

[By continuation of this sort of converse, he finally coaxes Hackem to "lay off." They go out arm-in-arm.]

#### SCENE 4

##### Office of Slashem Beatem

[Slashem at his desk. Has set of plans in front of him. He soliloquizes.]

Slashem: Well, I had a hard time to get these. So these birds think they have a chance on this job. Ha! ha! Well, I've fixed that guy, Hackem; and Cuttem thinks I'm going to protect him. Now I'll cut out the switches and put them back to back like Bunk does. [Phone rings.] Hello. Yes, this is the Junk Electric Company. Yes, this is Shimmy talking. What, you want me to figure a house? I'm pretty busy just now . . . You want it right away? What kind of a house is it? Cottage? . . . Yes . . . How long? [Writes everything down] How wide? 20 feet? How long? 50 feet. Yeh. How many rooms? Let's see . . . Just a minute. [Figures frantically.] Well, I'll do it for you for \$100. [Picks up paper he has been doing all figuring on and throws it in waste wastet.] But, gee-whiz, I forgot all about the Department of Electricity. Since that new guy got in there a fellow is up against it.

#### SCENE 5

##### Office of Skinnem and Soakum

[Enter both Skinnem and Soakum.]

Skinnem: Well, we're lucky boys. We beat out the nearest man to us by \$2000 on a \$5000 job. That's the way to show 'em how to figger. Isn't that so, Dave?

Soakum: Sure; let's look over the contract we signed. My rule is never to read a thing until I sign it.

[Reads.]

"All work that should have been described in the specifications and which is not shown on the drawings is to be executed in a workmanlike manner and furnished by the contractor without cost to the owner.

"If at any time during the construction of the building, the work should be ordered stopped by the architect, the contractor agrees to turn over to the owner all work already installed without compensation.

"If the contractor finds it necessary to move the adjacent property to make the plans fit the job, this contractor shall move such property.



"Now you know I have the inside there."



"Can you beat that?"



"Ask me something easy. I have the plans in my office right now."



"This contractor shall furnish bond in the amount of fifty per cent of contract price, mortgaged real estate with first and second mortgages preferred.

"This contractor shall furnish the necessary lumber, nails, and carpenters with saws and hammers, to perform the work called for in the specifications and plans.

"All building laws, ordinances, state rules and regulations, fees and permits, that conflict with the plans and specifications shall be disregarded.

"The owner and architect will take care of the necessary formality to have the authorities approve any such work.

"This contractor shall complete the work within 759 days. If work is completed prior to this time, the contractor shall be penalized in the sum of one hundred dollars (\$100.00) per day."

Skinmem: Now let's look over the plans and see where we get started.

[Phone rings.]

Soakum: Hello. Yes, this is Skinmem and Soakum. Yes, Mrs. Offmug, we were awarded the contract. Yes, ma'am, we'll be out there to start work the first thing in the morning. No, ma'am, it will be impossible for us to have the roof on in two days. Yes'm, yes'm, yes'm. [She doesn't give him a chance to talk. He hangs up the receiver exhausted.]

Skinmem: If this is the woman we have to work for, we are out of luck.

Soakum: Let's look over these plans and see where we made the mistake that gave us the job.

[They look. Dig up estimate after a great deal of trouble; locate it on a business card.]

Soakum: Holy Moses, we've left out the labor!

Skinmem: And we forgot to figure the roof.

Soakum: But think of our extras.

Skinmem: Well, we have to get busy. Let's start on the electrical contract. One of those birds told me material was going up and his figure would only hold for a day. Those electricians are fish, anyway; we can get them down to where we want them. [Phone rings again.] Yes, this is Skinmem and Soakum. Who? Oh, yes, the Spoofem Electric Company. Say! Where did you learn how to figure? All I asked you for was a figure on the work for the Offmug Apartments. You must have got mixed and were seeing double that day. This is after July first, remember. You're too high, I tell you. Oh, I won't tell you how much. But you're high. Sure, I'd like to have you do the work. Didn't I tell you that before we started? Way high. What's that? What? Cut? Well, come up and see me in half an hour. [Rings off.] Ha, ha! That was Cuttem; he's easy. [Phone rings once more.] Skinmem and Soakum. Yeh, yeh, the Wrex Company. Yeh, we received your bid, but we didn't ask you for any. Yeh. Say, I think you made a mistake. I only wanted a bid on the work of the Offmug Apartments, 20 rooms. I think your bid must have been the one you used on the Palace Hotel. What? You will shade it? How much? Sure I'd like to have you do the work. Didn't I tell you that before we started? Well, even if you do that, it'll still leave you high. All right, if you want to do business, call around in half an hour. [Hangs up receiver.] Well, well, they're coming fine.

[Once more the phone rings.]

Skinmem: Yeh, yeh, yeh, yeh! NO, I should say not. I didn't ask you for the price of your business. I don't want to be your partner. All I wanted was a bid for the electrical work for the Offmug Apartments. With a bid like you got, you could make a try for the general contract. What! Come right up. [Rings off.] There's Hackem. He'll cut, I know. [Cuttem enters, very much in a hurry and greatly perturbed.] Well, what do you want?

Cuttem: I called you up a few minutes ago. You said I was high.

Skinmem: Yes, the highest one in the bunch. Where did you learn to figure?

Cuttem: Well, how high?

Skinmem: High enough. So high we hate to tell you how high you really are. Now, we want you to do this work. You've done a lot of work for us, but you know that \$100 is \$100.

Cuttem: I'm not that high, am I?

Skinmem: Yes, and more.

Cuttem [astonished]: Well, I must have made a mistake. Let's see my bid.

Soakum: You remember what your figures are. That's enough. If you can't quote us a reasonable price, I don't know what we're going to do.

Cuttem: Well, how high am I?

[They keep silent. He makes so many demands finally Skinmem replies.]



"Haw! haw! That was the painting and decorating figures I gave him."

Skinmem: I'll tell you what I'll do. Here are some figures. Can you beat them?

[Shows him some letters, being very careful to turn over letterheads, making much ado about this business.]

There, what do you think of them?

[He will not allow Cuttem to touch them; only look.]

Cuttem [to himself]: I recognize the handwriting of that typewriter. I'll be condemned if that guy can beat me. He'll never get that job away from me. I'll show him who's doing the figuring here.

[Business of taking pencil and paper, and figuring in notebook, much concerned. Finally writes down figure on piece of paper and shows it to them.]

How's that?

Soakum: That's more like it. Why don't you fellows come down to earth?

The young man went because she promised to be a brother to him—you will want to go because it means contact with all the big men of the industry—

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Cuttem: Well, let's sign up the job.

Soakum: You wait just a minute. We have a lot of things to go over just now. We're busy. We'll call you up.

[They "stall him off" and send him away without signing.]

Skinmem: Haw, haw! The poor boob! That was the painting and decorating figures I showed him. They all fall for that stuff. We'll get this job down to where we can make some money yet.

[Enter Hackem.]

Hackem: I'm here to see you about that bid of mine on the electrical work for that job I called you up about. You said something about my being rather high.

Skinmem: Rather? I should say that you were rather high. You're so high we have to get a step-ladder to see your price. You must have gone off your head. You ought to be shamed to show your face in a decent contractor's office with a bid like that. Where do you get that stuff? Come down to earth. You make me—

Hackem [interrupting the tirade]: Well, let's get together on it. Maybe we can do something

[Business of same "stalling" again. Business of showing bid with letterhead turned down.]

Hackem [after seeing bid]: I'll never let that double-crossing crook beat me out of any job.

[Figures hurriedly. Usual business of cutting. Makes a good cut.]

Soakum: Well, that's a fair cut; but you are still away high.

[Hackem forthwith gets angry and gives a rattling sales talk. Price, quality, service; knocks every one else, has special look-in on material market; guarantees everything, and so on. Tries to sign them up.]

Soakum [after Hackem has finished]: That's all very fine, but you gotta talk to our pocketbooks, and you'll have to dig their ears out with a pencil. Get me?

Hackem: That's as low as I can cut. I'm losing money to do that job now. [Becomes angry.] What are you fellows doing—trying to peddle my bids?

Skinmem: Peddle? Whadyuh mean peddle? Get out of here!

[They throw him out, amid much clamor.]

Skinmem [after sitting down]: He's hopeless. He only cut off \$50. Don't worry, we'll get them down to where we want them yet. There's another one to show up.

[Telephone rings.]

Soakum: Yes, Mrs. Offmug. Yes'm, we'll surely be out there in the morning. Oh, yes, we have built houses before. Oh, yes, yes, yes, we'll be sure to do that. Oh, yes. [Hangs up receiver exhausted.]

[Enter Slashem.]

Slashem: Did you want to see me about my bid?

Soakum: You mean, did you want to see US? Now, look here, Dave: you're a good friend of mine, and I want you to do this job, but \$150 is \$150. Just to show you what an inside you have in this office, I'm going to do something for you to prove my friendship. This is something I never did for anybody else, and I wouldn't do it otherwise. This is one, just one, of the electrical bids that is lower than yours. I'd like to have you do the job. I'd even give you a preference.

[Shows him bid.]

Slashem [showing surprise]: Where did that price come from? Well, I'll tell you, Jack, we have an Association, and if any of those fellows caught me cutting prices I'd get an awful bawling out. I don't see how I can cut. I see he's \$600 under me. I couldn't cut that much. Now,

lissen, ain't I worth \$600 to you? You know I've done some big work, Jack. Remember, I got the Umpty-Ump job on a preference over six others. I've put in some of the biggest work in this city. These other birds have only been in business six months. I think that ought to be worth something. All these birds used to work for me. C'mon, Jack, this ought to be worth something to you.

Skinmem: Yes, but we're taking this on a narrow margin ourselves. If you are such a good friend of ours, why don't you cut something off for old friendship's sake?

Hackem: Well, I'm only above him about \$600.

Soakum: Yes, but he's offered to put in a lot of things that are not included in the contract. He's offered to wire those flats I own out on Blimp Street for nothing, and is throwing in the fixtures besides.

[Hackem, scratching head, wonders. Bright idea seizes him. Deliberately takes a roll of bills from his pocket, straightens them out, counts them carefully with back turned to them, but facing the audience. Holds them straightened out behind his back. Puts other hand in pocket and jingles dollars. Walks around the room.]

Hackem: Aw, Jack, gimme a preference. Nice little preference. Dear old preference. You know me, Jack. I want to tell the boys I got a preference.

[Finally they take the roll, sign him up hurriedly, and he walks out with contract signed.]

Skinmem: Well, that's not so bad. [Counts coin.] Here's \$300; and he'll do everything the other fellow will do.

Soakum: There's no use putting that on the books. We can just as well split it now.

Skinmem [doing so]: Well, let's go out and get lunch with the morning's profits. [They go out.]

## SCENE 8

### Office of Skinmem and Soakum

[Two months have elapsed, and the job is about completed. Skinmem and Soakum enter, dejectedly.]

Skinmem: That woman is driving me crazy. It's not enough for her to camp on the job all the time, chattering like a fool, but she has her husband there during lunch hours and is at me all the time to put in extras and everything. I don't see where we're going to get off.

[Phone rings. They are tragically seized with fear. They cling to each other. They try to make each other answer it. Business of "I answered it last time. It's your turn now." Finally they flip a coin. The ghastly lot falls to Soakum.]

Soakum [answering phone]: Yes'm, this is Mr. Soakum. Oh, yes'm. Yes, indeed, we'll do that. Yes'm; yes'm. [Rings off.]

Skinmem: Let's get out of here so's we can talk things over.

Soakum: Oh, I don't think she'll call up any more.

[Phone rings.]

Good Lord, is that her again? Well, it's your turn now

Skinmem [takes up instrument with utter resignation]: Yes, Mrs. Offmug, this is Skinmem and Soakum. Who. [His face brightens.] Oh, excuse me, Mr. Goatell, I thought it was that pest client of yours. She's been making my life a burden ever since we started that job. What? You want us to come over for our final payment. Yes, sir, I'll be right over.

[Rings off. Turns to Soakum jubilantly.]

H'ray, he has our 25 per cent over there waiting for us. The last one on the job. [Rushes out.]

[Soakum seizes phone; calls up local people. Buys goodly store of "private stock." Makes reservation on evening train out of city.]



[Phone rings yet again.]

Soakum [answering]: Hello. Yes. Oh, yes, Junk Electric Company. You want some money? Say, why are you always pestering us for your dough? You know you'll get it. Haven't you always gotten it? I tell you we haven't received our estimate from the owner. Don't get rough or you'll have to wait a longer time. [Hangs up quickly.]

[In rushes Skinnem with a wad of money.]

Skinnem: Well, we have it. Here it is. Now we can do what we want.

Soakum: How much did we make?

Skinnem: Well, we have money. It makes no difference.

[Phone rings.]

Soakum [answering]: Yes, Mrs. Offmug. Are you sure this is Mrs. Offmug? Just a minute, now. You are absolutely sure you are Mrs. Offmug? You say the walls are crumbling? The electric wiring won't work? The wire has just been wound around the studding and then brought through? All right. Shingles are falling off? Are you positive this is Mrs. Offmug? You are? All right. This is Skinnem and Soakum. You GO TO HELL. [Both go out.]

[CURTAIN]

## Drawing the Crowds to the Side Street Location

(More than all others, the electrical dealer can reap the benefits of effective advertising because he has, at his very hand, the most effective advertising medium. The story below proves that phenomenal profit-increases result from the electrical advertisement of electrical stores.—The Editor.)

In Sacramento on Ninth Street, between the capital city's two busiest streets (K and J), is one of Sacramento's attractive electric stores. Yet no one walking on K or J Street last August would have known that this store existed. Its attractiveness failed to catch the eye of the thousands of

wouldn't catch the crowds on K. Furthermore, moving to either street meant a triple increase in rent.

A very attractive electric sign was erected. The accompanying chart shows the result. The sign went up in August. Then followed an immediate increase in counter sales. The increase continued



The electric sign which has been responsible for drawing trade from two bordering main streets to a side street store

potential buyers of electric conveniences that passed on these busy streets day and night.

The manager of the Sterling Electrical Company, Inc., wanted a larger share of the patronage of those crowds. There were two things he could do. He could move to K or J Streets, or he could draw the public to his store. But if he moved to J he

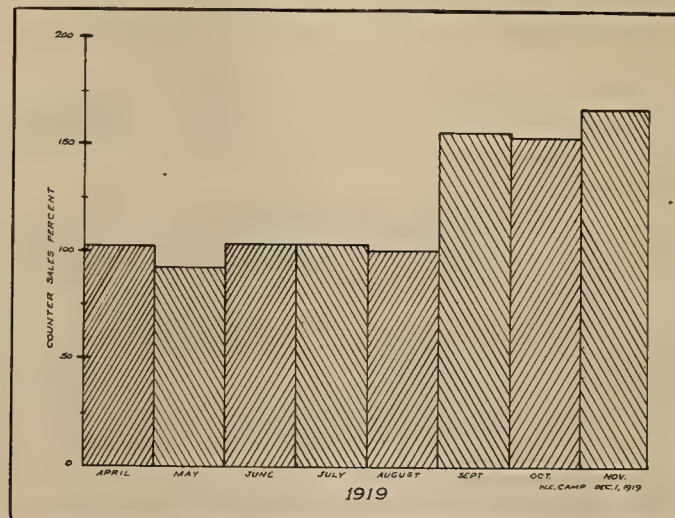


Chart showing the increase in counter sales which resulted from the installation of an attractive electric sign in front of a western shop in August, 1919.

during the second month. By the third month counter sales almost doubled.

It is estimated that the cost of the sign was equal to only one month's rent on the busy street. The cost of operation amounts to about \$15 a month, including lamp renewals, depreciation, electric current, and interest.

The Sterling sign works day and night for "Sterling Electrical Company." No one traveling on K or J Streets today can help noticing the sign when passing Ninth. It shows the progressiveness of the modern electrical merchant. Other electrical dealers can profitably follow this example and advertise electrical stores electrically.

The lady sends word by her maid that she regrets she is not at home—you would regret it exceedingly if you were not at convention —

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The district manager must know his men and must see that his men know each other, if his district organization is to function as a perfect unit of the entire company. The above group of employes have gathered for an organization meeting which is the method one alert district manager uses to organize the thought of his men.

## The District Manager

BY S. M. KENNEDY

(Unusual ability is required in the man who manages a territorial district for any large public utility company, since in his hands lies the company's local reputation for integrity and progressiveness as well as its regular business. The qualities necessary in the make-up of the successful district manager are set forth and ably discussed in this article.—The Editor.)

It is quite impossible for a large public utility company, supplying an electric, gas or telephone service, and covering a great area of territory, to handle all its business through one office. "Remote Control" may be of advantage in the distribution of some high voltage currents, but it is a poor way to serve customers who may reside at some distance from the central or general offices. Consequently, for the better protection of business and as a means of supplying a higher grade of service, the territory occupied is usually divided into districts, each one of which being in charge of a district manager. This is an important position, for not only is the operation of the company's business in his hands, but also its standing in the community and its local reputation for integrity and progressiveness. The district manager acts for the company in its intercourse with the public by virtue of his appointment, and he acts for the public in its intercourse with the company by virtue of his position. He must fairly represent both sides, as they are really a unit, the dual relations being so intermingled that a parting of the ways does not exist. That is, the permanent interests of the utility company and of the consumer are really along parallel lines.

### The Organizer

While working under the direction of the general offices, the district manager must have an intimate knowledge of the work in all the departments

of his organization, and of the duties and capabilities of each of his men. He must be not only a foreman and cashier, and with it all, a master of diplomacy. The processes of modern business are sometimes likened to a complicated machine, and the executive must program every part of his organization as carefully and thoroughly as the inventor designs the details of a great engine. The management of a public utility company is organized thought, exactly as the machine is the organized thought of the inventor.

The district manager should be a specialist along lines which make for efficiency in administration. There is just as much opportunity for real invention in the field of organization and administration as in the field of mechanics. The mechanical inventor studies out a machine in which all the parts are to work together to produce a given result. In doing this he deals with inanimate material; his work is wrought out along mechanical lines; he knows in advance how each gear, spring, pulley and lever will fulfill its mission. Its power to do is a mechanical certainty. The mechanical inventor does not give to any part of his machine any latitude whatever, and all the initiative must come from him.

The true executive, be he general manager or district manager, must also be an inventor; he, too, studies out a working machine where all the parts are to move in harmony to produce a given result.



However, he deals not with inanimate material, but with men with wonderful possibilities of initiative to help or hinder the working of the organization. To men working as parts of one harmonious whole, must be given a certain amount of latitude, in which to exercise whatever power of initiative they may possess. They must be given intelligent direction and then left, in a measure, to work out their problem in their own way. Of course, they are always under observation, and their work follows certain established lines—but no code of rules or regulations ever drafted can take the place of intelligence. The district manager should have a knowledge of men, exactly as the mechanical engineer has a knowledge of materials and mechanics. The right men must be trained and fitted into their proper places in the machine in order to obtain the right results.

### The Real Head

The public utility company which is operating in a large territory, with an eye to present requirements and future success, must build up the standard of the district manager. Men of high grade should be selected for the position, and the position should be made as important as possible, compatible with a company's general organization and methods



The district manager is responsible for local business-building and must continually work for the development of loads other than the lighting load in order that the power company may operate at full efficiency. The accompanying illustration shows a 76-hp. motor displacing a 100-hp. engine operating a pumping plant.

of operation. The district manager should not be a puppet or a marionette to act and move when some one in the general offices pulls a string. He should be the real head of his company in the territory under his control, and should be a conspicuous figure in that company. His company should be localized and the general offices of the corporation should only be referred to incidentally, in all intercourse with the public, and not as a center from which all instructions must come and all authority emanate. The district manager should be made responsible for the development of his local organization—and with this responsibility he should be expected to obtain satisfactory results.

The district manager may not have had an engineer's training, but at any rate he should gradually become an engineer by absorption, and should be absolutely familiar with the commodity handled by

the company, and the various methods of distribution which it has adopted. He must know all details in order to talk intelligently, either in public or in private, and understandingly to direct the work of the men under him. His position is no sinecure—but a real active job, requiring the use of all faculties and the benefit of all his experience.

### Custodian and Guardian

Perhaps one of the most important positions the district manager has to fill is that of custodian and guardian—custodian of the company's property and guardian of its interests. The property of the company in his district is under the general supervision and care of the manager, and as far as possible, he should know all that is going on, or being done in the way of changes, additions or betterments to the system. The care of the property also means its proper maintenance, and maintenance includes its appearance to the eyes of those inside and outside the organization. Cleanliness, neatness and tidiness are just as essential as quality and stability, as far as the public is concerned, and these attributes should never be overlooked. He should also know the weak places, if there are any, and be on the alert and able to act promptly should any trouble occur either from accident or destruction caused by the elements.

Not only are the plants and buildings under his care, but he must be familiar with the franchises, licenses and permits under which the company operates, to see that nothing may be considered by local legislative bodies which might threaten or imperil their value. With this end in view, it is of the utmost importance that all matters affecting or liable to affect the company's interests directly or indirectly should be immediately brought to the attention of the proper department in the general offices. The manager should not take it for granted that anything of local importance will be known without his saying something, but he should promptly send in his report to the proper officer. If the information has already reached the officer from another source, it won't hurt to have it again. Far better that the report go in from two sources than none at all. On the other hand, after making his report, the district manager has relieved himself of a certain amount of responsibility and can then await instructions how to proceed further.

### Administrator of Funds

The district manager is at all times expected to defend and advance the interests of his company. When it comes to the question of spending the company's money for any purpose, he will find it a good rule before making a recommendation to ask himself, "If this money were mine, if this business were mine, would I make this investment?" If he makes an unqualified recommendation for an extension, be it big or little, it should only be after giving an affirmative answer to this question. There may at

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Wm. Jennings Bryan is always running—you would run, too, if that were the only way to get to convention —

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times he reasons why it might be necessary for him to pass an application for an extension up to a higher officer without a recommendation, and the extension may be authorized for special reasons, perhaps affecting the company's interests elsewhere. However, it is up to the district manager to thoroughly understand local conditions; and the company must rely largely on his knowledge and recommendations, before authorizing any increases of investment in his district.

### Business Builder

Perhaps in no other line of industry have there been as many changes in connection with business development as in the central station industry. Only a few years ago, the business was entirely confined to that of supplying light. For five or six hours daily the plant was busy, and for eighteen hours it practically stood idle. Interest and depreciation, however, were going on all the time, and the cost per kilowatt-hour generated and distributed was necessarily high. Gradually a power load was developed, and the plant was busy for another twelve hours, and fixed charges per unit were enormously reduced. Then certain kinds of business were induced to operate all through the night, and the central station plant eventually began to pull some kind of a load for twenty-four hours each day. But the alert district manager knows that there is no limit to the development of the electrical business. He will regularly gather around him his salesmen and assistants, and show them what can be done to increase the company's income from present investment, and to point the way to profitable extensions which will produce greater earnings for the company in the future.

Some men say the lighting business has already been developed. The alert manager can show his men that there is not a home, office building, business house, industrial plant or factory in his territory that would not be better off if more lights were added in this place or that. More and better street lighting is demanded, as a precaution against accidents and a protection to life and property. This field is capable of great development. Electric power is now used in every direction—but not to the extent it should be. The alert manager can show just where more can be added to present installations, and where it can be introduced to displace other prime movers whose operation may be improved upon. And when it comes to the newer uses for heating and cooking, the alert manager can say to his men, "Gentlemen, you may start all over again on every street in every town, for every present consumer and every new customer must eventually own and operate an electric range." Scores of proven appliances for new uses are appearing for sale every year, and when these appliances may be counted by the hundreds of thousands on a company's system, there soon comes a demand for reinforcement of distribution lines in residence districts and a more constant load on stations and substations every day in the year. The alert manager knows he is now at a stage when load building has become more scien-

tific; where load factor improvement is substantial, and where present investment has no idle hours—and that eventually the only limit to scientific development may be a load curve which will resemble a straight line.

### Collector of Revenues

Not the least of a district manager's duties is that of collecting the revenues derived from the service supplied. It is well worth remembering at times, that all the work of harnessing the mighty mountain streams, all the work of building great power houses, all the money invested in long transmission tower lines and local distribution systems, all the feats of engineers, all the grinding machinery, all the executive ability of the officers and all the routine of the clerks—every detail handled from the president down to the elevator boy, lead up to the meter—and the product of the meter is dollars and cents.

The business of a central station company cannot be run successfully without giving liberal credit to thousands of people. Corporations such as street railways, transportation companies, telephone com-



A free electric cooking school like the one shown above is effective in establishing friendly relations with the public and convincing customers that the company policy is one of good-will.

panies and department stores, receive their money before the goods are delivered, but the electric company is required to deliver its service before it becomes due and payable. Consequently, it is of paramount importance that after waiting a month or more for its money, the electric company should collect its revenues as soon as possible after they become due. There are thirty-seven reasons why electric bills should be collected promptly. The first is, the company always needs the money. The second is that it is easier to collect soon than late. The alert district manager has no care about the other thirty-five reasons—the first two being sufficiently convincing. The amount of latitude and discretion given a district manager in handling certain individual accounts should be liberal. This refers to consumers whose business is seasonal, and whose money receipts may be irregular for one reason or another. But the general results are reflected in percentages of collections to moneys due, and the alert manager



will see that the percentage of his delinquents is held down to a minimum. There is always the last resort for an electric company to adopt when forcing payments, that is, discontinuance of service. This is usually effective, but should not be used until all other means of persuasion have failed. No man or woman ever feels the same toward a company if the service is once disconnected for non-payment, and it is sometimes better to nurse a delinquent along for a while, if there is a reasonable hope of settlement, rather than abruptly to sever the connections and leave a consumer sore and resentful for years afterwards.

### Harmonizer

The district manager requires to be a man of many parts, and there is no part more important than that which might well be termed "the harmonizer." The best definition of harmony is to say that it is the antithesis of discord—and if discord exists within the ranks of an organization, or with consumers on the outside, there is friction—and friction means loss of power. The harmonizer in a district is able to make the company's affairs run smoothly, and as harmonizer, the district manager will find it advisable at times to use a considerable amount of oil in order to reduce friction to a minimum. While the district manager must never lose sight of the duty he owes to the company, he must frequently put himself in the other fellow's place, so that he may properly understand some conditions and adjust them satisfactorily. The employees working under him will sometimes become fractious because of real or fancied grievances. If harmony does not exist in this direction, some part of the company's business will surely suffer. In handling employees, the district manager needs to use great tact to smooth out the wrinkles, to encourage where encouragement is needed, to reprove where reproof is necessary, and to commend where commendation is deserved.

### Friendly Relations

The company must look to the district manager to maintain friendly relations with its customers. He is the main point of contact, and by precept and example, it is up to him to indicate how the public should be cared for. The clerks, collectors, salesmen, meter readers and trouble men are liable to do in this respect what they see their superior do, and what they know he wishes to be done. And the public will keep on judging the company by the words and acts of the employees it sees rather than by the published policies of officers and directors who are seldom seen and rarely known. The district manager cannot be too careful and particular in the selection of employees coming in direct contact with consumers and the public. An ill-natured, indifferent clerk can make more trouble for the company in one day than two tactful men could patch up in a month. The very existence of the company depends upon the good-will of its customers. The business cannot be developed if present consumers are not satisfied, and they are easily and willingly pleased and satisfied if they receive that courteous and prompt attention to which they are at all times entitled. The

alert manager will find that a bright, cheerful office, devoid of partitions, gratings and windows between the employees and the public, will have a beneficial effect and help both clerks and customers to understand each other better. The manager cannot give too much attention to what goes on in the front of his office—an observing traveler tells of the following incident:

"I stood in a large railway station, awaiting my turn at the ticket window. Before me in line was a man neatly clad, clean and unmistakably a foreigner. He quietly passed a five-dollar bill beneath the rod and waited. The ticket agent caught up the bill with a vigor that threatened to tear it in two. 'What do you want?' he grumbled. 'I want to go to Boston,' said the man with imperfect English, but with perfect courtesy. 'To Boston!' bellowed the agent, 'I guess you don't know what you want.' 'I want to go to Boston,' repeated the man. 'You're either drunk or crazy,' snapped the other. 'This won't buy a ticket to Boston,' and he thrust the offending bill back through the window with a grunt that dragged itself into a crude smile as he turned to me. The stranger-in-our-land took up his money and walked away, his face pathetic in its pained bewilderment.

"As I folded my ticket, I caught the comment of a keen-eyed business man who stood near. 'Well, I always thought I knew why they have gratings on ticket office windows, but that incident gives me a new idea—it's to keep some agents from hitting the patrons of the road. I tell you, if I were a railroad president, I'd disguise myself like our friend bound for Boston, and two or three times a year I'd call upon every one of my employees. Whenever I'd receive a shade less consideration in my disguise than I received as 'the boss'—the man guilty of discriminating would be discharged.'"

The district manager may well look into the question as to how many of his employees are rendering the same kind of service to consumers as they would to him as the boss. How many would stand the business man's test? Of a different type is a story that comes from another source, concerning a recent incident in the office of a power company. A customer, who was also of foreign birth, called one day on the manager to ask for some information regarding his account and contract for service, to be used in connection with a lawsuit the customer had with a third party. The information asked was duly sent and later the customer called upon the manager. He said, "Mr. Blank, I want to thank you for the data supplied, and your courtesy extended to me in connection with the matter." The manager stated that he was glad to furnish the information asked, and told the customer that as for the courtesy, he was entitled to receive that at any and all times. The customer smiled and said, "Mr. Blank,

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Something happened when the Germans met the Yanks—there will be something happening at the big meeting in Pasadena which you cannot afford to miss—

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before I die I am going to visit Ireland, so that I may learn to say some things as nicely as you do."

### The Arbitrator

Experience has demonstrated that in the public utility business, the time comes around when trouble of some sort is threatened in each district. It may be a municipal ownership agitation; the application for a franchise by an opposition company, or a demand for a concession in rates, or something else. Then it is that the company needs a friend and then it is that the public remembers all the good and all the bad that the company is responsible for in the past. The district manager may have people pulling for him or working against him, depending upon the way these same people have been previously treated in their intercourse with the company through its employees. One thing is sure and that is, if all the people were pleased with the company, then they would all be on the company's side in any controversy. Knowing this to be a fact, the wise district manager will see that all his points of contact are so protected that no matter how a customer may feel when he enters an office, he will go away pleased. Such a condition may be of greater value than all the franchises, permits and licenses that could be granted or awarded. At any rate, such franchises, permits and licenses must automatically become more valuable, when the permanent good-will of the public has become a part of the company's assets.

## Western Ideas

IF YOUR COMPETITOR talks about you, put him on your payroll. Never mind what he says so long as he talks.

The above sentiment has been expressed by a Colorado dealer who is evidently a believer in the unusual 'ad' and who is keen enough to realize that even derogatory criticism by a competitor makes for excellent publicity.

INTERNAL BETTERMENT is the watchword of wide-awake companies today. Company pride, loyalty, and vision are being stimulated among employees in various ways.

The bulletin boards in the offices of the McGraw-Hill Publishing Company display posters which aim to awaken employees to the opportunities of advancement which their own firm is anxious to offer.

### Do you realize that—

The Composing Room has given us 3 editorial assistants and 2 advertising men.

In a company as large as ours vacancies are bound to occur frequently.

Outsiders are never considered for these opportunities if we have promotable material right here in our own organization.

It's a pleasure to promote an employee!

### Do you realize that—

11 of our department heads have come up through the ranks from clerical jobs

AND

9 of our clerical workers were recently messengers

Effective bulletin board notices help to create enthusiasm among employees

ADVERTISING MATERIAL is effectively displayed by the Golden State Electric Company in Los Angeles. A rack which matches the woodwork of the store is divided into sections, each one labeled with a sign clever enough to attract every customer's attention. In this way the dealer can take advantage of the customer's slightest interest in any elec-



Booklets find their way to the interested customer by way of this well designed rack

trical appliance. There is no better salesman than a good pamphlet in the hands of an interested customer.

The signs are changed every week or two so that the rack has always something new to tell the customer.

PROFESSIONAL LEADERS are as necessary as professional demonstrators in attracting customers to a store. It is a well known fact that one sheep will invariably follow another. Why not make use of this knowledge in our work-a-day selling world?

At a recent window demonstration there was a large, interested gathering watching the wonderful cures of some patent medicines, but when the aspiring performer held up a placard inviting the onlookers to come inside the shop for a heart-to-heart talk, without exception the crowd dispersed and left the unsuccessful window artist to pick up the work again from the beginning of the story. After watching the scene for three unsuccessful performances, a certain man took the lead and accepted the invitation to have the closer interview, "without obligation." He was immediately followed by three others, all eager to listen and learn. When he left the shop, those who had seen him from the street during the conversation went to him unhesitatingly for information.

A tastily arranged window, an unpainted, intelligent demonstrator, familiar with the apparatus and actually "making it work," will, with two or three "customers" to start the crowd in the right direction, add noticeably to the sales.



## Electricity at the Orange Show

BY W. B. STODDARD

(Abundant proof that electrical goods are susceptible of highly artistic treatment for display purposes is afforded in the following description of electrical exhibits at the Southern California Orange Show. The colorful settings and ingenious devices employed should prove of interest to all who are concerned with electrical merchandising and the various types of publicity to which it lends itself.—The Editor.)

Electricity was one of the most important factors in giving beauty and brilliance to the tenth annual Orange Show recently held near San Bernardino, California. In honor of the event the city of San Bernardino was in gala attire. The big city hall was completely outlined in lights, and chains of lights of different colors were thrown across all the principal streets, while at the Show the electrical utilities and electrical merchandise concerns vied with each other in the attractiveness of their displays.

The elaborate exhibit of the Pacific Electric Railway was of deep cream, brilliantly trimmed with oranges, lemons and grape fruit, and having long panels at the four corners showing typical California scenes, such as the Missions, ostriches, beaches and orange groves. Within was a life-sized figure in white and orange holding a sheaf of narrow orange ribbons, each of which ended in a miniature electric car about two inches long. The floor disclosed the topography of southern California, and showed the entire network of city and interurban lines of the company. Around the edge was a track on which ran two electric cars—freight and passenger—about 18 inches long. A card at the base of the display advised: "1200 miles of railway."

The Fresno water department had an artesian well, which flowed over rose-colored lights into a concrete basin, the broad rim being fringed with scarlet cyclamen.

The San Gabriel Valley Chamber of Commerce, who won the first prize in the feature exhibits, had their revolving pyramid of oranges and other citrus fruits, which was topped with a figure of the Angel Gabriel, lighted with a series of rose-hued bulbs, concealed among the foliage.



This neat back porch, equipped as a complete electric laundry, was planned by the Woodill & Hulse Electric Company of Los Angeles, and found great favor among the housewives.

### Featuring Household Appliances —

In another tent devoted to industrial displays, was an attractive idea inaugurated by the Woodill & Hulse Electric Company, Los Angeles, whose display was calculated to implant in the heart of every woman the desire to possess an electric washing machine. It showed the screened-in back porch of a California bungalow, raised several feet from the ground, painted a soft grey and half covered with a big rose vine. In the earth outside were planted shrubs and flowers. The door stood invitingly open, and inside was an electric washing machine in opera-



One of the central exhibits, occupying double space, was that of the Blue Bird Washing Machine Co. It had pillars of green, and a green lattice-work overhead, hung with masses of pink roses and green foliage. Suspended from the roof were a number of old-fashioned lanterns, with paper slides, upon which bluebirds were painted. Several of the washing machines were shown in operation, and a pleasant attendant explained their manipulation.

tion. A young couple were on hand to demonstrate the good points of the machine, hand out literature, and take orders if desired.

The Illinois Electric Company, western branch, featured vacuum cleaners. Fastened to the wall were gay balloons of many colors, and several of them, fastened together, with little dolls suspended from them, floated about the booth. On the wall, too, were the original sketches from which were made the pictures that adorned their booklet, "The Woman's Part in Modern Art." They also handed out to all visitors little credit coupons, good for \$2.00 towards the purchase of a vacuum cleaner, which would be honored by any authorized Apex dealer in southern California.

It is a mistake to invite a lady to dinner when you have only 25c. in your pocket—it would be a grave error for you to miss the big spring conventions —

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The part played by color in all these exhibits was particularly noticeable. The Southern Sierras Power Company's display had a low fence and gate in the background, painted a vivid orange, separating the window from the interior of the store. This gate was twined with smilax, and the gate posts were topped with baskets lined with smilax and filled with oranges and grapefruit. A tall pedestal in the center of the display held a big shallow basket of oranges, lemons and grapefruit, the basket being



The Southern Sierras Power Company's exhibit was notable for its distinctive use of color and the sunny effect of its decorations and illumination. The orange painted fence upon which smilax was twined, and the shallow baskets of oranges tied with green and yellow ribbons were effective in carrying out the brilliant color scheme.

tied with green and yellow ribbons. The floor was of orange crepe paper with a border of green, upon which were laid a number of fine specimens of citrus fruit. Over the low gateway the interior of the brightly lighted salesroom could be seen. Here was shown an electric range, and an electric washing machine, while a large card by the range suggested: "You can cook without electricity—but not so well."

The Field Electric Company had an orange tree, set in a tub covered with green paper. From the trunk of the tree extended broad ribbons of green or orange, which reached to some electric appliance—range, percolator, chafing dish, toaster or iron. In each corner of the window were set baskets of grapefruit and oranges. In the day time this orange tree appears to be covered with natural oranges, but at night it was seen that each was a little orange bulb with a light inside.

The Prest Electric Company chose the Orange Show colors, the dome of their booth being hung with long streamers of yellow and green. In this green and gold setting, decorated with oranges and foliage, they had a good display of the Ohio Tuec cleaners and Crystal washing machines.

Fairbanks, Morse Company had a splendid exhibit of machinery, some of it electrically operated. Their power fruit sprayer attracted special attention. In the background was a panorama showing a grove of orange trees, while in the foreground, planted in the moist earth, were half a dozen fruit bearing trees. From time to time a demonstration was given of power spraying, the mist which enveloped the trees being guaranteed to deal death and destruction to all forms of citrus tree pests.

## THE VALUE OF NEATNESS

BY C. M. TWOMBLY

(A certain contractor-dealer has been able to prove that artistic display and consistent neatness always bring in generous returns. His ideas on the necessity of neatness in the shop are given below.—The Editor.)

Fine woodwork does not bring patronage. Neatness is one of the prime factors which will attract customers into a store and hold them as regular patrons. Keep the articles you have for display immaculately clean. Display them in the best way that you can and you will find that your business will increase and your list of regular customers will grow steadily longer.

The Los Angeles Beacon Light Company was able to increase the amount of its sales 100% during the month of December solely through neat and artistic display of Christmas goods.

All contractor-dealers realize that window advertising is more effective than advertising of any other sort and they should realize that here, above all other places, the doctrine of neatness is of supreme importance. A slovenly window cannot be effective.

The Beacon Light Company have two very large windows with plenty of light to display the articles so that they attract the eye. Do not crowd the



This Los Angeles shop increased its sales 100% in a single month solely by displaying its Christmas goods in the neat and artistic manner shown above.

articles, but place just enough to look right and to give the pleasing effect which always comes from correct balance. Neatness is one of the greatest things in life; it will help to get you there every time.





Typical views in the Goldfield mining district, showing the Goldfield Consolidated Mines on the left with the Laguna headframe in the background and the headframe of the Florence mine in the picture to the right.

## Electricity in Gold and Silver Mining

BY B. B. BECKETT

(In the West electricity plays an important part in the mining of precious metals. The following article tells of the actual power consumption of a typical property in Nevada and analyzing the most important electrical operations involved. The author has for some time been electrical engineer for these mines and is now doing consulting engineering.—The Editor.)

In the West, the mining of precious metals was one of the earliest and has always been one of the important consumers of electric power. In mining proper, the electric drive still shares honors with compressed air, but in milling, the electric drive is almost universal.

The title of this paper is intended to cover both mining proper and also milling, since gold and silver ores are usually milled at the mines as part of the same enterprise. Of the two operations, mining and milling, the latter is the heavy power consumer, taking about three-fourths of the total. This, of course, refers to producing mines, excluding those in the development stage only. Milling, also, is the more desirable load from the central station point of view, since it is steady and continuous, 24 hours a day and every day in the month. The load-factor of a mill load is about 80% and that of a combined mine and mill load about 70%. Power consumption for all purposes will be close to 40 kw-hr. per ton of dry ore mined and milled, of which 30 kw-hr. will be consumed by milling alone.

### Consumption for Nevada Mines

The following table shows the actual power consumption of a typical property in Nevada, that of the Goldfield Consolidated Mines Company at Goldfield. These figures represent practice at Goldfield for the years 1915-16-17, and correspond to a production of 1000 tons of dry ore per day. Mining was carried on through vertical shafts with an average depth of 600 ft., with a moderate amount of water to be pumped, and the mill was the usual stamp mill with cyanide treatment.

The volume of production does not affect the power consumption per ton provided the plant and equipment are of proportionate size. For instance, at the Nevada-Packard mine, at Packard, Nevada, where the production is only 100 tons per day, the power consumption for all purposes has averaged only 30.9 kw-hr. per ton for three years, measured

on the low tension side of transformers. This figure covers both milling and mining, but the only power used in mining in this case is that for compressed air, about 4.5 kw-hr. per ton, since the mine is worked through a tunnel under the ore bodies and above the mill. At Aurora, Nevada, the power consumption for all purposes in the summer of 1916 was 43.4 kw-hr. per ton, of which the mill alone was responsible for 36.07 kw-hr. Production at Aurora was 500 tons per day. Mining was done through a tunnel as at Packard, and hence the only power for mining was for compressed air, 5.1 kw-hr. per ton, and for the electric trolley railway in the tunnel, 0.93 kw-hr. per ton. The greater power consumption at Aurora in milling is accounted for by the fact that the ore was entirely of hard quartz and came from the mine wet and sticky so that it would clog up in the crusher and conveyors.

POWER CONSUMPTION AT GOLDFIELD				
	Motor capacity hp.	Maximum load hp.	All day average hp.	Kw-hr. per ton dry ore
Mines:				
Light equivalent .....	15	10	10	.2
Compressed air .....	400	420	260	5.3
Pumps .....	280	210	93	2.0
Hoists .....	750	1000	88	1.8
Miscellaneous power.....	100	30	7	.2
Total Mines, 1530			458	9.5
Mill:				
Crusher (gyratory).....	150	50	10	.26
Conveyors to battery.....	60	40	12	.29
Stamp battery .....	250	240	212	4.26
Tube mills .....	400	480	448	9.20
Chilean mills .....	200	300	190	3.86
Concentrate tables .....	60	34	31	.63
Air compressors (for agitation chiefly).....	250	250	240	4.9
Pumps .....	340	215	156	3.3
Miscellaneous power.....	270	100	50	1.2
Light and heat.....		80	40	.8
Total Mill, 1980			1389	28.70
General Depts., light, heat, and power,				1.4
Losses in line and transformers and in regulation,				3.4
Total all.....				43.0

The first baby is always beautiful—but no more wonderful than is Pasadena in Maytime —  
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### Power Used for Drilling

In all the above, it is interesting to note the amount of power used to compress air for machine drilling. At Goldfield, a record was kept of the number of machine-shifts, that is, the number of machine drills in use each shift. After making proper allowance for air for other purposes, the power consumption per machine-shift was computed and found to vary from 65 to 100, averaging about 80 kw-hr. Each machine is in actual operation only about 4 hours out of each shift, and therefore consumed the surprising amount of 20 kw. continuously while in operation. This is the power to compress the air to supply the drill, and includes all losses.

In the above figures for power used in mining, it should be stated that these cover development work and the removal of waste as well as ore, so that the figures per ton of ore would be much less if the work were confined to ore alone. For instance, in the table above for Goldfield, the item of hoisting is 1.8 kw-hr. per ton of ore, but the total work of hoisting for all purposes, including waste and men and timbers as well as ore, was about double that for ore alone, so that this figure may be divided in two, making 0.9 kw-hr. per ton. Now the energy represented by lifting one ton 600 ft. is 1,200,000 ft.-lbs., or 0.45 kw-hr. Therefore the over-all efficiency in this case was about 50%.

### Load Factor for Hoisting

It will be noted that the load-factor for hoisting is very poor, less than 9% at Goldfield, according to the above table. This is on the basis of the maximum momentary demand, unregulated. As a matter of fact, the hoisting peaks were absorbed by a storage battery through a motor-generator regulating set and did not fall upon the transmission system. On account of the extremely fluctuating nature of a hoist load, intensified by the poor starting characteristics of the induction motor, it is customary for power companies to impose restrictions upon this service, either by special charges or by requiring special regulating apparatus. This is one reason why compressed air has been used in some instances even where the air was compressed with transmission power, as in the large installation in Butte. More recently the fly-wheel motor-generator set has been used for this purpose, the fly-wheel acting as a reservoir of energy from which the hoist impulses are drawn. Unfortunately this method is efficient only when the hoisting is done on a regular schedule and continuously, as long as the set is in operation, else the no-load losses of the set are excessive in comparison with the net energy used.

Another method that has been used is the very ingenious one of automatically unloading a main air compressor simultaneously with any sudden increase of load. This, of course, involves the use of a compressor large enough to supply the required amount of air after allowing for the time it runs unloaded, and also involves the inefficiency due to this idle running. The method, therefore, is best suited to infrequent and irregular hoisting, being in this just opposite to the fly-wheel method.

Still another method of regulation is by use of a storage battery and motor-generator set. This is the method used at Goldfield and at Tonopah. It has the advantage over the fly-wheel method of providing in a single set for the absorption of fluctuations from any number of hoists or from any other apparatus, and of having very small no-load losses. Such a plant also performs other service, particularly that of furnishing emergency power in case of failure of the main supply. The plant at Goldfield served five hoists, aggregating 750 hp., later increased to 950 hp. by the addition of a sixth hoist. It could, under ideal conditions, absorb a power swing of 1000 kw. and could furnish, as emergency reserve, about 250 kw-hr. The no-load loss amounted to 35 kw., and the storage battery working loss of the entire plant



This substation building houses the regulating plant and the distributing substation of the Goldfield Consolidated Mines Company

about 50 kw. The loss in the storage battery amounted to about 8000 kw-hr. per month, the kilowatt efficiency being only about 60%.

Water entering the Goldfield Consolidated Mines at the principal sump amounted to 200 gal. per min. and was lifted a total of 1850 ft. in two stages, the first, 400 ft., by turbine pump, and the second by triplex pumps. The turbine delivered approximately 500 gal. per min. and consumed 75 kw., including line and transformer losses. The triplex pumps delivered 446 gal. per min. and consumed 160 kw. The corresponding efficiencies are 50.2% and 76.0%, respectively. The turbine was handicapped about 5% by a long discharge pipe.

### Crushing and Stamping

Referring again to the table for power consumption at Goldfield, it is interesting to note that the amount for crushing is so small, only a little more than one-twentieth of that for stamping. In the first of these operations, the ore is reduced from the size produced in mining down to pieces the size of eggs; and in the stamps, it is reduced from this to the size of peas. In the tube mills and Chilean mills together it is reduced to powder. This last operation has the heaviest power consumption of all, taking three times as much as that of stamping. It is to be noted that about two-thirds of all the power used in milling is accounted for by the process of pulverizing the ore, and at Aurora and Packard this proportion was three-fourths or more.



In predetermining the power consumption in any given operation, the foregoing figures will be useful, and also, certain computations may be made as follows: Power for stamps can be predetermined quite closely, being simply a function of the weight of stamps, the height to which they are raised and the speed. All of these factors are independent of the rate at which the ore is fed except that the height will be a little less with a full mortar than with an



The mill of the Nevada-Packard mine at Packard, Nevada, is shown above. This is a 100-ton cyanide mill of the latest design, treating both gold and silver ore.

empty one; hence the maximum efficiency is obtained when the ore is being crushed as rapidly as possible. A stamp battery load is very constant, changing only when stamps are hung up. At Goldfield, the stamps weighed 1050 lb., dropped an average of 6.75 inches, and each dropped an average of 104 times a minute. There were 20 stamps per motor; therefore

$$\text{Hp.} = 20 \times \frac{104 \times 1050 \times 6.75}{12 \times 33000} = 37.2$$

The average output of these motors was 47 hp.; therefore the mechanical efficiency of the drive was 79.2%. This covers loss in cam shaft and cams, two belts and counter shaft.

#### Tube Mill Loads

A tube mill load is also very constant, but it can be predetermined only very roughly by calculation. It is a function of the speed, weight of charge, and the height to which the center of gravity of the charge is raised by the rotation. Evidently this last factor depends upon the speed which therefore affects the result in other than simple ratio; but for maximum grinding, the speed should be such that the pebbles are kept constantly rolling down hill but not carried over by centrifugal force. This will also be the condition of maximum power. The mills at Goldfield were 5 x 22 ft., revolved 23 times per minute, and the weight of charge was about 14 tons, filling the mill about half full. Assuming that the rotation caused the surface to be deflected to an angle of 60° to the horizontal, the torque necessary to maintain equilibrium was 25,000 ft.-lbs. On this basis, the useful work was 54.8 hp. per mill, or 164.4 for each group of three. The average output of the motor driving each group was 224 hp. This indicates

a mechanical efficiency for the drive of 73.4%, covering losses in first belt, counter-shaft, back belts, jack shafts, gears, and tube mill journals. Even at constant speed, the height to which the charge is elevated will vary considerably with the character and condition of pebbles and of ore. In general, the power consumption increases when the rate of feed is increased, when the feed is relatively coarse and sharp, and when the pebble charge is increased. In Goldfield, variations of as much as 15% were observed with change of feed.

A crusher load fluctuates badly and the driving motor must be several times the size required for the average load. Where belt drive is used as is usual, the starting requirement is severe, for the belts must be either very heavy or very tight, else the fine dry dust will cause them to slip. For this reason, gearing is to be preferred, but if belts are used, then slipping motors should be used.

#### Pumping

The pumping of pulp and solutions is responsible for a large part of the power consumed in a cyanide plant. For clear solutions, triplex pumps are generally used; but for slimes and gritty solutions, centrifugal pumps are necessary and these are lined with wear resisting material. The mechanical efficiency of slime pumps is very low, about 40% under best conditions and nearer 20% in average practice. This is because of rapid wear of runners and linings and the common fault of over-speeding. The maximum economical head for a slime pump is only about half that for the corresponding clear water pump. If the head is high, the wear is very rapid in the clearance spaces until the excessive back leakage finally takes up the entire delivery of the pump.

While undergoing treatment, the pulp is kept in agitation by compressed air or by mechanically revolving arms in the tanks. The latter is the more economical in power consumption, taking only about one-fourth as much as the compressed air method. Mechanical agitators should be carefully adjusted in speed, since the power consumed by them varies approximately as the cube of the speed, provided the speed is always sufficient to prevent settling.

The fact that so many motors are necessarily over-size for the work does not mean, as might be expected, a low power-factor for the mill load as a whole, since the bulk of the load is always on the stamp and tube mill motors, which operate at a very high power-factor. At Goldfield, the power-factor of the mill was actually about 84% at the motors, though this was reduced to about 75% by excessive reactance in feeders and transformers due to improper arrangement; and at Aurora, the power-factor of the mill, excluding the synchronous motor driving the mine air compressor and excluding lights, was 86.3%.

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The man who wears a high hat in a snowstorm invites a snowball—we have invited the East to the Pacific Coast. Let us make it worth while for them —

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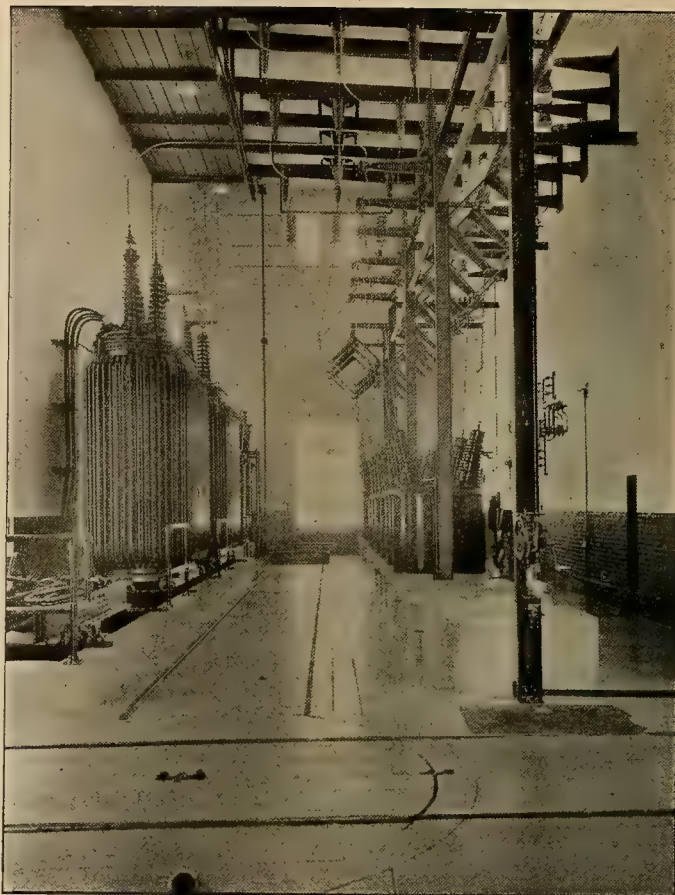
Cedar Falls substation of the Chicago, Milwaukee & St. Paul Railroad, showing two 2000-kw., 3000-volt, direct-current generator sets.

### PROGRESS IN RAILWAY ELECTRIFICATION

The recent electrification of the coast division of the Chicago, Milwaukee & St. Paul Railroad completes a total of 647.4 miles of electrically operated lines on this system. The newly electrified section from Othello in central Washington, to Renton Junction on the Puget Sound end, was opened Mar. 5th.

The locomotives used are equal to 2.7 steam passenger locomotives of the latest type and will pull a passenger train of twelve coaches up the heaviest grade on the system at a speed of 25 miles an hour.

All the current used in operation is generated



High tension room, Cedar Falls substation, showing two 2500-kva. transformers and 10,000-volt oil switches.

from water power, and supplied from the plants of the Puget Sound Traction Light and Power Company and the Long Lake plant of the Washington Water Power Company. Current is delivered at 100,000 volts and stepped down to 3,000 volts direct current for use on the locomotive motors.

The first electrification of the Chicago, Milwaukee & St. Paul lines (the Rocky Mountain division of 226 miles) was completed and put into operation in December, 1915. When the unelectrified gap between Othello and Avery is closed, there will be a complete electrification extending for over 860 miles.



Electron, the Puyallup River station, where some of the power for the railroad is generated



The new division completes all but a small gap in the entire 860 miles of electrified road



## Time—The Fourth Dimension of Space

BY A. H. HALLORAN

(Great interest has been attracted to the consideration of the ultimate constitution of matter due to the possibility of a verification of Einstein's theory brought about by a recent observance of a deflection of light from the stars, in its passage near the sun on its journey to the earth. Dr. Crehore's articles now appearing in the Journal of Electricity have likewise added emphasis to this discussion. Here is a simplified explanation of the Einstein Theory of Relativity that should prove timely and interesting.—The Editor.)

Fifteen years ago Einstein, a Swiss Jewish professor in Berlin, proposed a new theory of motion claiming that Newton's classical laws of gravitation were merely an approximation, and that the theory of an ether-filled space was no longer necessary to explain many physical phenomena. His revolutionary ideas were received with doubt by many prominent scientists at that time. Today, however, two of his most important deductions have been proven by rigorous experiment, and former scepticism has been converted into an eager interest throughout the scientific world.

Einstein's "Theory of Relativity," as it is called, is ordinarily expressed in such intricate mathematical terms that it is incomprehensible to the non-mathematician; yet it is possible to give a brief account of its salient features in language which will be intelligible to the layman. Mathematics is the shorthand of science, a most powerful tool for digging into its problems in the hands of the adept, and capable of being translated into simpler terms when so desired.

### No Absolute Motion

The first postulate of this new theory is that all motion is relative, that there is no absolute standard for the measurement of motion. This means that the motion of one body can be defined only with respect to that of another. Motion is merely simultaneous change of position in space and time. This principle is familiar to everyone traveling in a railroad train paralleling a train going in an opposite direction. If the other train is moving and yours is standing still, you frequently feel that you are moving as you look at the passing train. You cannot judge the motion of a smoothly moving train if the curtains are drawn at night, nor could you discover the forward motion of the earth if you could not see the heavenly bodies.

### Constant Velocity of Light

Einstein's second postulate is that the velocity of light in free space is independent of the velocity of the observer or of the source. This has been definitely confirmed in experiments conducted by two American physicists, Michelson and Morley, who found that the speed of light is the same whether the earth is moving toward the source of light, away from it or at right angles to it.

The combination of these two simple ideas leads to some startling conceptions as to the theory of the universe, as will be explained after developing the new conception of time and space upon which the theory of relativity is based.

As no one has observed a place except at a time, nor a time except at a place, it has been found neces-

sary in exact physical work to combine the two. If  $x$ ,  $y$  and  $z$  be the rectangular co-ordinates of space, corresponding to length, breadth and thickness, and if  $t$  represents time, then  $x y z t$  represents a point in space at definite time. This substitutes four dimensions for the three with which we are familiar, making time the fourth dimension of space. Instead of thinking of time and space separately, we must think of them together. In the words of Minkowski, the scientist who developed the mathematical statement of this fact, "Henceforth Time and Space in themselves vanish to shadows and only a kind of union of the two preserves an independent existence."

While this unified time-space conception is difficult to grasp at first, a little thought will show that it is logical, and well in accord with our every-day experience. There is nothing more mysterious about the fourth dimension than there is about the other three. A dimension is simply a measurable direction, and we could use a fifth dimension just as easily should occasion require.

Though it is hard mentally to conceive of a fourth dimension in space, this is comparatively easy when the fourth dimension is time. Points that are far apart if measured in three dimensions, may be close together in the fourth,—events may happen at the same instant though hundreds of miles apart.

Suppose that instead of a three dimensional consciousness, you had only a one dimensional consciousness, and that was situated at the surface of a bucket of water. Suppose that a foot rule were gradually introduced into that bucket of water at a uniform rate of speed, the rule having marked on it twelve lines at one-inch intervals. As the rule is lowered into the water your one dimensional mind would be conscious only of a series of twelve lines appearing at regular intervals. Thus a linear foot of "space" will be represented to your one dimensional space consciousness as twelve equal periods of "time." Or suppose that you had a two dimensional space consciousness situated at the surface of the water, and that there was introduced a cylindrical rod on which were marked a series of circles at regular intervals. In this case likewise, you would be conscious only of the successive appearance of the circles at regular time intervals, and time would thus become a third dimension to your two dimensional space consciousness.

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The woman who still uses an old-fashioned wash tub is behind the times—but not more so than the electrical man who fails to attend convention —

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The analogy also holds true as regards our present three dimensional consciousness with time as the fourth dimension. We have no difficulty in thinking of the fact that half the earth's surface is in darkness while the other half is illuminated by the sun, and thus the time succession of day and night becomes simultaneous in our mental conception.

Inasmuch as motion is relative, so likewise are its two components, time and space. Time is merely a form of perception by which we express our consciousness of the relative change in things, space of the relative position of things. One is an arbitrary measurement of duration, the other of position. Neither is absolute.

The practical reason why mathematicians prefer to use four dimensional analysis is not only that it gives an exact statement of space-time conditions, but also that the four dimensional language substitutes short, simple and easily attained expressions for the long, awkward and complicated terms that result from laborious calculations in three dimensions. Any student struggling with the complex equations of electro-magnetic phenomena found in the ordinary text book, should welcome the ease of attack afforded by four dimensional analysis. The principle of relativity describes physical phenomena in a simpler and more symmetrical manner than was before possible.

Einstein has so revolutionized our ideas of space and time that there is hardly a branch of science that is not affected by this new conception. Perhaps the most fundamental result of his theory is that it eliminates the necessity for the hypothetical ether of space, which has long functioned as a crutch to aid the understanding of natural phenomena. His clearness and boldness of vision found the ether to be a superfluous hypothesis, though it is only fair to add that he has furnished no evidence either for or against the ether's existence.

The three great principles of physics—the conservation of energy, the conservation of momentum and the conservation of mass,—previously considered to be fundamental, are shown by Einstein to be but special cases of a new principle of extended momentum. Matter and energy are found to be but different aspects of the same entity. When we are concerned with a body's inertia or mass we are dealing with matter; when we are interested in a body's motion we are dealing with energy. When a body is set in motion, both its energy and its mass are increased.

#### Measuring Kilowatts by the Pound

Matter is proven to be merely condensed energy. This energy is so tightly locked up that there is at present no known method of releasing it for useful work, though it is a possibility of the future which may well be turned to man's benefit, or, mayhap, to his destruction. In radium, the heaviest known element, we see spontaneous partial liberation of energy, the total amount given up being about two hundred and fifty times the energy obtained by burning an equal weight of coal. One gram of

matter is calculated by this theory to equal  $9 \times 10^{20}$  ergs of energy, or twenty-five million kilowatt-hours. Thus 1 kilogram (2.2 lb.) of matter contains twenty-five billion kilowatt-hours, or approximately the total output of all electric light and power plants in the United States during the year of 1918.

As Crehore recently has shown in these columns all the laws of gravitation originally developed by Newton can be expressed in an equation which attributes the cause of gravitational force to the electromagnetic action of the moving negative electrons contained within the atom of matter, an electron being a negative electric charge. Newton's law of instantaneous gravitational action, however, is upset by Einstein's deduction that no action can exceed the velocity of light. Inert mass then simply becomes latent energy and the mass of a body at rest is simply the measure of its internal energy. Think of selling kilowatt-hours by the pound!

#### Physical Quantities Dependent Upon Speed

According to Einstein the shape and size of a body is dependent upon its speed and direction of movement relative to the observer. For ordinary velocities this effect is extremely slight but at a velocity approaching that of light it becomes more marked. The kinematical shape of a rigid body differs from its geometrical shape by a contraction of all its dimensions in the line of motion in the

ratio of  $\sqrt{1 - \frac{v^2}{c^2}}$  : 1, where  $v$  is the velocity of the

body and  $c$  that of light. Thus a sphere relatively becomes an ellipsoid.

A similar deduction holds true with respect to time. The time interval measured by a moving

clock must be multiplied by  $\sqrt{1 - \frac{v^2}{c^2}}$  in order to

agree with measurements made by a stationary clock.

Measurements of length made parallel to the motion of a moving yardstick must be multiplied by

$\sqrt{1 - \frac{v^2}{c^2}}$  in order to agree with measurements

made in a stationary system; i.e., a stationary observer will obtain a smaller measurement for the length of a moving object than will an observer traveling with that object.

Likewise the mass  $m$  of a body moving with a velocity  $v$  and having a mass  $m_0$  when at rest is

$\frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ . The mass or weight of a spinning top

is greater than that when it is at rest. The temperature of a moving body, also, must be multiplied by the same factor to agree with measurements made by a stationary observer.



In studying the electromagnetic equations it is found that the electromagnetic forces acting on a moving charge in a magnetic field are nothing but electrostatic forces when measured by an observer moving with the charge.

Einstein's theory explains the shifting of the orbit of Mercury, which could not be accounted for by Newton's theory. It foretold the deflection of light by the gravitational action of the sun, as was definitely confirmed at the last total eclipse. This means that a ray of light has inertia or mass, being attracted by gravity.

A third experimental test of the truth of this theory, the shifting of certain lines of the spectrum toward the red end in a magnetic field, has not yet been accomplished.

Thus the theory of relativity leads to the conclusion that almost all physical quantities are functions of the velocity of a body relative to the

axes of reference. The factor  $\sqrt{1 - \frac{v^2}{c^2}}$  is prac-

tically unity in all ordinarily observed phenomena and therefore negligible, but in the case of electrons emitted from a radioactive substance or cathode rays produced by high potentials it is great enough to be taken into serious account.

All statements herein made are susceptible of rigorous mathematical proof as given in several texts. Those best combining clarity of English expression with completeness of treatment are "The Theory of the Relativity of Motion" by Richard C. Tolman, published by the University of California Press, Berkeley, California, and "The Electron Theory of Matter" by O. W. Richardson, published by the University Press at Cambridge, England. To these the interested reader is referred for the mathematical proofs that have been omitted in this attempt at a popular account of the theory.

## Steam Turbine Characteristics

BY WILLIS T. BATCHELLER

(A thorough knowledge of the classification and structure of the various types of steam turbines is important in the practice of steam engineering. In the second of a series of articles this author, who is electrical engineer with the Seattle Lighting Department, takes up the theory of the single-stage impulse turbine in operation.—The Editor.)

A steam turbine consists of a rotor made up of one or more wheels or cylinders carrying blades or buckets against which one or more jets impinge. Steam turbines are classified as follows:

1. According to the method of steam expansion:
  - (a) Impulse turbines, with steam expansion only in the stationary blades or nozzles.
  - (b) Reaction turbines, with steam expansion both in the stationary and in the moving blades.
2. According to the method of subdividing the available energy:
  - (a) Pressure stage turbines, where the available steam pressure drop is subdivided among two or more successive sets of rotating blades, each set taking care of the drop of pressure.
  - (b) Velocity stage turbines, where the steam at constant pressure passes through two or more successive sets of rotating blades, starting with a high steam velocity and decreasing the same from set to set.

Steam Turbines	Impulse	{	Single Velocity	{	De Laval	Single pressure Stage	
			Multi-Velocity Stage	{	Terry Sturtevant Curtis (small type) Westinghouse		
		{	Single Velocity Stage	{	Kerr De Laval Rateau		Multi pressure Stage
			Multi-Velocity Stage	{	Curtis		
	Reaction	{	Multi-Velocity Stage	{	Westinghouse Parsons Allis-Chalmers Parsons		
			{	Multi-Velocity Stage	{	Westinghouse	
		Combined impulse and reaction					

### Single Stage Impulse Turbine

The simplest type of turbine is the impulse turbine having a single set of nozzles through which the steam is expanded, imparting velocity to the jet

itself, which impinges against the vanes of a single rotating wheel, giving up its kinetic energy to the wheel.

The distinctive feature about the impulse turbine is that the pressure drop occurs entirely in the nozzle and the pressure is the same on both sides of the wheel. The velocity of the jet is from 2000 to 4000 feet per second and for economy the peripheral velocity of the wheel must be from 700 to 1400 feet per second. This results in a speed of several thousand revolutions per minute, which must be reduced by gears for ordinary applications.

### Theory

A given weight of steam at a given pressure and temperature occupies a certain known volume and contains a known amount of heat energy. If the steam is permitted to expand to a lower pressure without receiving additional heat or giving up heat to surrounding bodies it is capable of doing a certain amount of work which will be the same whether the expansion takes place in the cylinder of a reciprocating engine, a rotary piston engine, or the nozzles and blades of a steam turbine.

Using the steam conditions which exist at the Lake Union steam plant, namely 190-pounds gauge and 125° F. superheat, we will make the necessary computations for a non-condensing impulse turbine, exhausting at atmospheric pressure.

When the cook leaves the salt out of the soup you miss something—think of all you would miss if you failed to attend convention —

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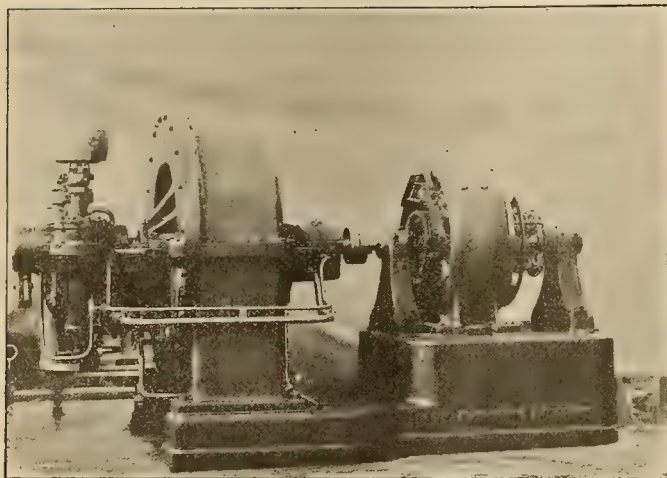


## PROPERTIES OF STEAM

Pressure	190 lbs. ga.	0 lbs. ga.	0.732 lbs. abs. or 28½ in. vacuum
Temperature	511°	212°	91.70°
Specific Vol.	2.71 cu. ft.	26.79 cu. ft.	446.2 cu. ft.
Heat of Liquid		180.00 B.t.u.	59.70 B.t.u.
Total Heat of Steam	1270.5 B.t.u.	1150. B.t.u.	1100.0 B.t.u.
Heat after adiabatic expansion		1065. B.t.u.	890. B.t.u.

Under these conditions

the initial heat contained in 1 lb. steam is 1270.5 B.t.u.  
the final heat is 1065. B.t.u.  
the heat drop is then 1270.5 — 1065 = 205.5 B.t.u.



50-kw. Allis-Chalmers impulse turbine and generator exciter set at Lake Union steam-electric station, city of Seattle.

If the steam expands in the cylinder of a reciprocating engine, the energy given up in forcing the piston forward is

$E = 777.5 (1270.5 - 1065.) = 82,026$  ft. lbs. per lb. of steam.  
If the steam expands within a perfect nozzle the energy will be given up in imparting velocity to the steam itself, and

$$E_2 = \frac{V_1^2}{2g} \text{ ft. lbs. per pound of steam}$$

If the velocity of the jet is retarded to  $V_n$  feet per second, as by placing a series of vanes in its path, then the energy given up to the vanes, neglecting all losses, is

$$E = \frac{V_1^2 - V_n^2}{2g} \text{ per pound of steam.}$$

If the kinetic energy is completely absorbed by the vanes, then  $V_n = 0$  and the energy given up is

$$E_3 = \frac{V_1^2}{2g}$$

Since  $E_1 = E_2$

$$777.5 (H_1 - H_n) = \frac{V_1^2}{2g}$$

$$V_1 = 223.8 \sqrt{H_1 - H_n}$$

Substituting quantities from steam conditions assumed in problem,

$$V_1 = 223.8 \sqrt{1270.5 - 1065}$$

$$= 223.8 \sqrt{205.5}$$

$$= 223.8 \times 14.34$$

$$= 3210 \text{ ft. per sec.}$$

Using a peripheral velocity of the turbine rotor of 1000 feet per second, and a mean diameter of three feet, the turbine speed will be

$$\frac{1000}{3 \times 3.1416} = 106.1 \text{ rev. per sec.}$$

$$= 6366 \text{ r.p.m.}$$

The theoretical horsepower developed by a jet of steam flowing at the rate of one pound per sec.

$$\text{may be expressed: } \frac{E}{550}$$

$$= \frac{V_1^2 - V_2^2}{2g \times 550} = \frac{3210^2 - 1310^2}{2 \times 32.2 \times 550} = \frac{10,304,100 - 1,716,000}{35,420} = 214 \text{ hp.}$$

Steam consumption per horsepower hour,

$$W = \frac{3600}{214} = 16.8 \text{ lbs.}$$

Heat consumption per horsepower per sec.

$$= 16.8 (1270.5 - 180)$$

$$= 16.8 \times 1090.5$$

$$= 18,320 \text{ B.t.u.}$$

Thermal efficiency

$$E_t = \frac{H_1 - H_n}{H_1 - J_n}$$

$$= \frac{1270.5 - 1065}{1270.5 - 180}$$

$$= 0.188 \quad \text{or } 18.8\%$$

Rankine cycle ratio

$$E_r = \frac{2546}{16.8 (1270.5 - 1065)}$$

$$= \frac{2546}{7374}$$

$$= 0.345 \quad \text{or } 34.5\%$$

Under the above conditions a commercial impulse turbine would have a water rate of about forty pounds per horsepower hour.

The actual Rankine cycle ratio would be

$$E_r = \frac{2546}{40 (1270.5 - 1065)}$$

$$= 0.31 \quad \text{or } 31\%$$

The series on The New Physics, by Dr. A. C. Crehore, has been suspended for this issue in order that it may extend through the special convention issues in April and May. The ninth of these important articles will appear in the April 1st issue.





If electric pumping drains the reservoir, gravity irrigation tends to replenish it. The effect of irrigation on the water table is shown by the fact that since the great increase in the use of irrigation in the vicinity of Fresno, the water table of that district has risen 50 inches.

## Conserving the Water Table in Electric Pumping

BY CHAS. H. LEE

(The relation of ground water supply to the electric pumping load was discussed in the first part of this article, published in the Feb. 15th issue. In the continuation below, it is pointed out that some of the areas pumped already show signs of depletion, and that underground supplies must be conserved if the load is to be a permanent one. The various steps necessary to attain this end are considered. The author is president of the California State Water Commission. —The Editor.)



Gravity irrigation of the foothill region is a safeguard to the water supply of the valley below served by electric pumping.

HERE are four recognized methods used to determine the annual inflow or re-charge of an underground reservoir. These are known as the intake, discharge, water-table and under-flow methods. The first consists in measuring the quantity of surface water that is absorbed and percolates down to the plane of saturation; the second in measuring the ground water that escapes through springs and by evaporation from soil and

nardino Valley; or where the supply comes largely from one stream, as on the Niles Cone. Stream gagings at the point where streams enter the valley, and at one or more stations lower down in the valley, furnish information as to absorption. Minor amounts may also be absorbed from direct rainfall or from small tributary drainage areas. This method does not indicate the extent of unavoidable losses from ground water and is not to be depended upon where the safe yield of the reservoir is desired.

vegetation; the third in observing the fluctuations of the water table which represent the filling or drainage of the ground water reservoir; the fourth in measuring the flow of ground water at selected cross sections.

### Choice of Method

The intake method is most useful in arid regions where mountain streams flow out over gravelly, alluvial cones, losing water rapidly as in the San Ber-

The discharge method is also best adapted to arid regions or to regions in which precipitation is confined to the winter months. In humid regions, it is difficult to differentiate between evaporation losses through soil and vegetation, as to whether the water is derived from temporarily absorbed rainfall or from permanent ground water. There is also the necessity of distinguishing between direct runoff and ground water runoff in streams. In arid regions, however, the problem is relatively simple. Spring flow and seepage inflow into streams can be readily measured by ordinary stream gaging meth-

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An interview with her father has inspired many a young man to go to work—the inspiration which convention affords will mean much to the work of the electrical industry in the West —

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ods. No vegetation, except the ephemeral spring grasses, grows without drawing its supply directly from a permanent ground water surface or from artificial irrigation, and soil evaporation is unmistakably indicated by permanent moisture or surface incrustation of alkali. The rate of evaporation from soil and vegetation depends upon the evaporativity of the atmosphere, the depth to the water table, and the character of the soil and vegetation. The measurement of losses can be made from large tanks and requires from two to four years for accurate results. The results obtained by this method should serve as an independent check on those obtained by the intake method, and in addition furnish data upon which to base safe yield estimates.

The water table method is especially well adapted to California conditions where there is a rainy season during the winter when most of the replenishment occurs, and a dry season in the summer when withdrawals by evaporation and pumping for irrigation occur. The average annual rise of the water table multiplied by the percentage of available pore space and the area of the water table for a given underground reservoir, gives the annual increment to ground water supply. There are various details which must be considered in making the field observations and computations therefrom which need not be discussed here. In general, however, the method is most reliable when applied to basins filled with open, porous and somewhat uniform material without inter-bedded clay formations and with flat slope of the water table. The greatest difficulties in the application of this method are in determining available pore space, and in distinguishing between general use of the water table and rise in wells due to pressure.

The underflow method consists of determining the rate at which water is percolating through a selected cross-section of porous material. It involves the measurement of three factors: (1) The area of the cross-section; (2) the velocity of the percolating waters; and (3) the porosity of the material. The latter is usually the most uncertain factor. The velocity can be observed with a fair degree of reliability by the Slichter electrolytic method. This method has a very restricted use for making determinations of re-charge or discharge, as the only condition under which it can be applied is where water percolates along a definite course, such as a narrow stream valley bordered by impervious formations.

### Practical Applications

There are three problems which may be presented to the management of a power system in connection with electric pumping.

**First:** Will a given untried district provide sufficient permanent pumping business to justify the investment necessary to serve it? The answer can often be obtained by an experienced hydrologic engineer during the course of a short field investigation. At most the cost of such an investigation would be a negligible percentage of the investment.

**Second:** Should service be actively extended in a given occupied district? This requires a more

comprehensive and detailed study, which should have as its objective a determination of the safe ground water yield of the district. Such an investigation would probably involve (1) the tracing out of the boundaries of underground reservoirs and a study of geologic formations; (2) the gathering of complete well data; (3) water level measurements in wells; (4) measurement of natural ground water losses and pumping draft with an independent check against re-charge. The program for such a survey should be planned so that the expense would be proportionate to the importance of the supply and the extent of the company's business.

**Third:** What should be done to improve the situation in an occupied district where water levels are persistently falling? There are several policies to be followed, all of which require more or less education of the public and cooperation with local development organizations and land owners.

If the district overlies an underground reservoir within which artesian pressure exists with flowing artesian wells, very effective results may be obtained by capping such wells and preventing waste when the water is not in use. The California statute approved March 6th, 1907 (Genl. Laws, D.K. Act. 4356; and Deering's Penal Code, p. 752), provides for the



An artesian well on a ranch, flowing 37 in. and now being pumped by a 15-hp. motor and 6-in. pump, is giving up about 80 in. of water. One of the methods of conserving the underground water supply is to cap these artesian wells during the non-irrigating period.

prevention of such waste and prescribes penalties therefor, but the initiative in prosecuting offenders must be taken by county officials, and opposing or indifferent local public opinion may have a deterrent effect. In one county, the district attorney appoints a deputy who inspects all flowing artesian wells during the non-irrigating season and reports all violations of the law. Marked improvement in water levels and artesian flows were observable in this county within two years after enforcement of the law commenced. A more general enforcement of the law would doubtless result if administered by a state office.

If the district lies within an underground reservoir, fed by torrential mountain streams with large gravel cones including waste land, very good results

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The man who tastes an olive as it comes off the tree learns something—the electrical men who attend this spring's convention will learn many things of importance—

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may be obtained by "water spreading." This consists in diverting the winter flow of the streams during falling stages and between storms and leading it onto the adjacent gravel slopes in contour basins, or spreading it out in many small heads in order to increase the absorption and so increase the annual ground water re-charge. This method is being extensively used in the valleys of Southern California and with marked success. The work is done by an association of the water companies which receive the greatest benefit.

If the streams are not torrential and little or no waste land exists, as along the East side of the San Joaquin and Sacramento Valley, the same result can be accomplished in another way, namely, by gravity irrigation of upper-slope and foothill lands with natural flow and storage water, and as far as possible the irrigation of mid-slope and lower lands by pumping from wells. The seepage losses from irrigation, especially on the more open soils of the upper slopes, are unavoidably large and constitute a permanent source of ground water supply for the lower lands. In this connection the efforts of local communities to accomplish foothill storage of winter and flood waters may well be encouraged, and also the gravity irrigation of upper lands. The logical zone for per-

power can best be exercised by the state, and should be comprehensive and effective.

**First**, the regulatory body should have authority and be provided with funds to make investigations and studies of ground water resources and underground reservoirs throughout the state. Such investigations might well be carried on with the two-fold purpose of giving a basis for administrative action and furnishing information to the public in the form of printed reports useful to land owners or prospective investors.

**Second**, there should be supervision of all new ground water development, the drilling of irrigation, municipal or industrial wells being allowed only under permit from the State. The regulatory body should also have authority to make ascertainment of all pumping rights initiated prior to the enactment of the authorizing legislation.

**Third**, the necessary administrative machinery should be provided to supervise the use of ground water, to observe water levels in the various underground reservoirs, and to close down pumping plants in accordance with the established and recorded priorities whenever overdraft was occurring, until a condition of equilibrium of the water plane was established. The latest priorities might be able to pump in wet years, but not during a series of dry years. The supervision of artesian wells and prevention of waste therefrom might also be included in the administrative duties of such a body instead of being left to haphazard local action as at present.

The program outlined above is not without precedent, being followed in several Western states. It is in fact the same procedure as is prescribed in the Water Code of Oregon for surface waters where it has proved eminently satisfactory. The California Water Commission Act at present specifically excludes underground waters except "subterranean streams flowing through known and definite channels." The latter are practically negligible as sources of economic ground water. With public control of ground water development, the permanency of the electric pumping load in an otherwise doubtful district might be regarded with some assurance.

### Summary

In conclusion it may be stated:

1. That the sources of supply, for electric pumping from wells, are underground reservoirs, underlying the valleys and coastal plains of the state.
2. That certain of these underground reservoirs are unfavorably situated with reference to sources of replenishment and are being over-pumped with resultant lowering of the water level; that certain others are more favorably situated, but with pumping have experienced a temporary lowering during the past two years, due to exceptionally light rainfall and runoff; and that a third class, because of very favorable replenishment conditions or small pumping



The logical place for the permanent pumping service is in the low lands where there is a tendency to water logging and alkali accumulation. The picture shows a drainage plant in the vicinity of Fresno, and indicates the leaching of the land of alkali through electric pumping.

manent irrigation pumping is the center and lower slopes of the valley, where there is a tendency to water-logging and alkali accumulation at the surface. With intelligent distribution of shallow well pumping plants in such a region, there is possible not only the development of a permanent ground water supply by pumping, but the drainage of the land and control of alkali conditions. Large opportunities lie open to development of this character on every stream delta along the east side of the great valley.

### Public Supervision

The methods suggested above for conserving and replenishing ground water supply can generally be worked out through local effort and cooperation. The only effective manner in which overdraft from an underground reservoir can be prevented, however, is by limiting development and use. Such regulatory

Capt. Cook failed to get to the North Pole—no electrical man who wishes to keep up with progress should fail to attend the spring conventions —

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draft, have not experienced noticeable lowering of the water level.

3. That there is no general lowering of water level throughout extended areas of the state, but that each underground reservoir is a special case by itself, the persistent lowering of water levels occurring only in those underground reservoirs where the pumping draft exceeds the rate of replenishment.

4. That it is practically possible for trained ground water hydrologists to ascertain the boundaries of underground reservoirs and determine with a certain degree of accuracy their annual re-charge and safe yield.

5. That there are methods of increasing and conserving the natural supply of underground reservoirs which local investigation may often reveal.

6. That the management of hydroelectric power companies engaged in irrigation pumping might well shape their future policies in the light of information thus obtainable.

7. That state supervision of the development and use of ground waters, with power to prevent too extensive pumping development and to stop waste, would work to the interest of both land owners and public utilities which supply power for pumping from wells.

## The Record of 100 Dam Failures

BY LARS JORGENSEN

(Electrical development in the West is mainly dependent upon hydroelectric projects involving extensive harnessing of the natural water powers. In view of the large number of such projects affecting both the water and power supply of the Pacific Coast, the following records relating to dams are of considerable interest. The author is a prominent San Francisco engineer. The second installment of this compilation follows in an early issue.—The Editor.)

During the past ten years the writer has paid considerable attention to the various causes responsible for over 100 dam failures. These failures have been recorded from time to time in engineering magazines, which fact has largely contributed to the improvement of the art.

For the benefit of others, a list will be given below of more than 100 dams that have failed, including a short description of when and why they failed, and, in most cases, their principal dimensions. Reference will also be given where possible to periodicals wherein a full description of the conditions leading up to the accident can be found.

existing arch dams are exceedingly highly stressed, more so than any other type of dam, and are nevertheless intact.

One gravity dam polygonal in plan upstream failed by undermining. It was built on piles in a gravel bed. After the failure the dam presented the appearance of a bridge whose abutments were standing on the hillside, and whose openings were about 56 feet broad by 108 feet high.

Earth fill dams seem to fail quite freely. The cause seems mostly to be water going over the crest or seeping under the cut off wall. Rock fill dams fail on account of similar causes. Reinforced concrete dams generally have failed by the water undermining the structure.

### RECORD OF DAM FAILURES EARTH DAMS

1873—Conshohocken Hill Reservoir near Philadelphia, Pa. Bottom lined with 18-in. clay, upon which was laid a brick paving in cement. Bottom lining broke away in 1873. It was repaired and failed again in 1876-1879-1886.

1874—May 16th—Mill River Reservoir Dam, Williamsburgh, Mass. 600 ft. long, 43 ft. high, 16 ft. wide on top. Slopes on both sides  $1\frac{1}{2} : 1$ . Core wall 2 ft. thick at top, 5 ft. 9 in. thick at bottom. Earth with masonry core wall. Water found its way under the core wall. Loss, 140 lives and \$1,000,000 damage.

1876—March 20th—Lynde Brook Reservoir, Worcester, Mass. 287 ft. long, 27 ft. high, 25 ft. wide on top. Earth with rubble masonry on inside face. Water leaked around culvert passing through embankment. Damage \$1,000,000.

1877—March 27th—Staffordville, Conn. 150 ft. long, 26 ft. high. Earth with masonry face wall, 10 ft. at base and 4 ft. at top. Water leaking along waste pipe. Some lives lost; damage, \$300,000.

1882—July 10th—Lebanon, Ohio. 30 ft. high. Earth. Water flowing over crest.

1886—April 20th—Mud Pond Dam, East Lee, Mass. 325 ft. long, 15 ft. high; 28 ft. thick at base, 6 in. on top. Earth with a dry boulder wall on the down stream side. Poorly constructed. Seven lives lost. Damage \$250,000.

1888—November 10th—Roanoke, Virginia. Earth. Bottom settled and caved in.

1888—February 2nd—Rock Springs Water Works Reservoir, Blairtown, Wyoming. Water leaking around a pipe laid through dam.

1889—May 31st—Johnstown, Pa. 72 ft. high, 20 ft. wide on top. Earth and clay. Inside slope  $2 : 1$ ; outside,



The Calaveras dam near San Francisco, of the hydraulic earth fill type. The middle section of the upstream side pushed into the reservoir during construction, the clay core exerting an outward pressure towards the bottom on account of the great height and softness.

All conceivable types of dams are included in the list with the exception of the pure arch dams. Of dams of this type the writer has not been able to find the record of a single failure, although there are a number of freak dams among this type. For instance, one arch has the alignment so seriously at fault, that the radius at the top varies from a minimum of 58 ft. to a maximum of 80 ft. The dam section is only 3 ft. thick for the upper 40 ft. Some



1½ : 1. Inside slope protected with light riprap. Water overflowing crest. Loss of life between 4,000 and 10,000. Damage \$9,000,000. Engineering Record, June 8th and 15th, 1889.

1889—August 25th—Spring Lake Reservoir, near Fishville, Rhode Island. 825 ft.; 18 ft. high, 35 ft. bottom and 8 ft. top. Clay and gravel. Inner slope paved with stone. Portion washed away was just above the waste pipe. Three lives were lost. Engineering Record, August 31, 1889.

1890—May 21st—Gunnison, California. Reservoir 20 ft. deep. Leaks along drain pipe.

1890—April 10th—Nebraska City, Nevada. Two reservoirs failed. Earth, 8 ft. wide on top. Slope 1 : 1 inside—1½ : 1 outside. Depth of water 17 ft. Soil very porous. Lined with 2-in. plank covered with 1 ft. of earth.

1891—June—Dallas, Texas. 29 ft. high, 12 ft. wide on top, with an inner slope of 2 : 1. Clay without core wall. Inner slope paved with brick in cement set on edge upon 3 in. of gravel. Settled vertically from toe to outer slope for a length of 300 ft. Brick and cement lining cracked.

1892—June 4th—Spartansburg Dam near Oil City, Pa. 180 ft. long, 10 ft. high. Earth and rock. Water running over crest of dam.



The Lower Otay dam which is situated near San Diego, is of the rock filled type. This failed in January, 1916, when water overtopped the structure.

1893—August—Portland, Maine. Earth. Slopes 1½ : 1 on each side. 6 ft. on inner slope was puddled clay and 6 in. of broken stone. Water following drain pipe. Five lives lost. Engineering Record, August 19, 1893.

1893—August—Milburn Reservoir, Brooklyn, N. Y. Puddle bottom of reservoir leaked. Engineering Record, April 28, 1894.

1894—October 14th—Lancaster, Pa. Earth with puddle center. Water leaking around outlet pipe. Engineering Record, October 27th and December 8th, 1894.

1894—December 13th—Portland, Oregon. Concrete lining failed. Engineering Record, Feb. 2, 1895.

1894—Roxborough Reservoir, Philadelphia Water Works. Depression in embankment. Clay washed away and water escaped. Cost \$140,000 to reconstruct interior lining. Engineering Record, January 12, 1895.

1894—May—Lima, Montana. Spillway washed out; left dam intact.

1894—May 25th—Avoca, Pa. Insufficient spillway.

1894—November 3rd—Ansonia, Conn. Making a gap 200 ft. long, 35 ft. deep. Water percolating along waste pipe laid through dam. Engineering Record, November 10, 1894.

1894—October 1st—Philadelphia, Pa. Queen Lane Reservoir. The bottom was lined with 4 in. of concrete upon a layer of clay puddle 2 ft. thick. Water leaked out. Cost of reconstructing interior lining, \$275,000. Engineering Record, December 22, 1894.

1896—Montreal, Canada. Masonry wall backed first by puddle and then with an earth and stone embankment.

1897—Melting Reservoirs Nos. 1 and 2, New York. Both dams failed. Upper dam 250 ft. long, 30 ft. high, failed first. Lower dam 220 ft. long, 24 ft. high. Earth with masonry core wall. Water over crest. 7 lives lost. Engineering Record, July 17, 1897.

1900—July 2nd—Grand Rapids, Michigan. Earth with clay core lined on the inside with rubble masonry. Water 25 ft. deep. Water coming over top of dam. Damage \$100,000. Engineering Record, July 14, 1900.

1900—October—Wilmington, Delaware. Earth lined with clay and faced with brick. Leakage of water along pipes laid through bank. Engineering Record, October 20, 1900.

1901—April 21st—Middlefield, Mass. 500 ft. long, 20 ft. high, 50 ft. base, 30 ft. top. Earth faced with rubble walls. Water overflowing crest. Engineering Record, May 4, 1901.

1901—May 19th—Victor, Colorado. 430 ft. long, 25 ft. high. Earth dam. Inadequate spillway. Engineering Record, June 8, 1901.

1901—October 31st—East Liverpool, Ohio. Lined with 18 in. of concrete laid on 27 in. of puddled clay. Break over pipe laid through embankment. Engineering Record, November 2, 1901.

1901—West River Providence (2 dams). Both composed of fine gravel and sand. Water over crest close to wooden sluice way.

1903—April 11th—Bonney Irrigation Reservoir, Delta, Colo. Earth dam. Break in dam over 100 ft. long. Depth of water, 34 ft. Engineering Record, April 25, 1903.

1903—February 22nd—Shelton, Conn. Earth fill with masonry down stream wall of a batter 1 in 10. Failed near spillway. Muskrats burrowing in embankment and water finding its way under the masonry wall. Engineering Record, February 28, 1903.

1903—July 5th—Jeannette, Pa. 300 ft. long, 20 ft. deep. Earth fill. 15 ft. wide on top. 1 : 2 side slopes. Spillway could not carry run-off and water overtopped dam. 40 lives lost. Engineering Record, July 11, 1903.

1904—October 1st—Lake Avalon Dam, near Carlsbad, N. M. 1380 ft. long, 48 ft. high. Composite structure of loose rock with earth on upstream side. It failed by water forcing a passage through the dam, not by overflowing. Engineering News, July 6, 1905.

1904—July 17th—Water Works Dam at Scottsdale, Pa. 60 ft. high. Earth rolled in 6 in. layers. Water working through dam at one end. Faulty design, no core wall. Engineering News, August 4, 1904.

1905—September 3rd—Norwich, N. Y., Sherburne Water Works. 2 earth dams. Upper dam 300 ft. long, 34 ft. high. Earth with puddle core. This was overtopped by flood and washed out. Water went to lower reservoir and partly washed out lower dam. Engineering News, September 14, 1905.

1905—June 21st—Ithaca, N. Y. Low dam on Six Mile Creek, 15 ft. high. Failed during great flood. Engineering News, June 29, 1905.

1905—August—Bridgeport, Conn. Hydraulic Company. Earth dam. Spillway too small. Water overflowed top of dam. Engineering Record, August 12, 1905.

1905—July—Leroux Creek, Colorado (2 dams). Earth. 25 ft. high. Water overflowed due to spillway being too small. Engineering Record, July 22, 1905.

1905—September—Ketterling, England. Settlement in earth dam while being built. 12 ft. wide on top; inner slope 1 : 3; outer slope 1 : 2½; maximum height 46 ft. Puddle core settled. Engineering Record, September 30, 1905.

1907—March 18th—Yuba River, Cal. Debris Barrier No. 1. Hydraulic fill, anchored by piles, rock and concrete facing. 630 ft. of the dam was carried away in a great flood. Water was 7 ft. above crest. Engineering News, August 8, 1907.

1907—June 5th—Cache la Poudre River Dam near Fort Collins, Colorado. Engineering News, June 27, 1907.

1909—September 5th—Blue Water Dam in the Zuni Mountains, New Mexico. Rock fill with earthwork apron and a central puddle wall carried to bedrock. 325 ft. long, 35 ft. above stream bed. Water overtopping the dam. Engineering News, September 30, 1909.

1909—May 20th—Mecaxa Hydraulic Fill Dam, Mexico. Earth dam with clay core. 190 ft. high; upstream slope 3 : 1.

Father, on coming in contact with a rocking chair in the dark, swore—swear now that you will come in contact with the big men of the industry at Pasadena —

PASADENA — MAY 17-21, 1920



down stream slope 2:1. Soft clay core bulged out before dam was finished. *Engineering News*, July 15, 1909.

1909—September 6th—Zuni Black Rock, New Mexico. Hydraulic earthfill and rockfill. 720 ft long, 70 ft. high. The dam was undermined. *Engineering News*, December 2, 1909.

Sheffield, England—Dale Dye Dam. Earth fill with puddle core; 1254 ft. long, 95 ft. high. Both slopes  $2\frac{1}{2}$ :1. Poor design. Wegmann.

1910—March 7th—Credit River, Ontario, Canada. Earth dam with concrete core, 700 ft. long. Failure caused by flood. Dam was being constructed and flood water could not be carried away fast enough. *Engineering News*, April 14, 1910.

1911—October 6th—Black River Falls, Wisconsin. Dells and Hatfield dams. The two earth dams failed on account of water flowing over top of dam. *Engineering News*, October 10, 1911.

1912—March 15th—Winston, N. C., Water Works Dam. Earth and masonry. 24 ft. high. Insufficient spillway and poorly constructed. *Engineering News*, April 11, 1912.

1912—February 10th—Union Bay, B. C. Earth fill over a log crib. Very poor design and construction. There were no trenches in the foundation. Dam was overtopped and disintegrated.

1912—April 7th—Toronto, Canada. Earth fill with concrete core 35 ft. high and buttressed; 700 ft. long. Dam was overtopped and washed out for 130 ft. *Engineering Record*, April 27, 1912.

1912—May 28th—Ansonia, Conn. Earth fill with concrete core. Water forced its way beneath the retaining wall.

1912—April 23rd—Dalton Dam near Mineville, N. Y. Earth fill with core wall. Water worked its way through a sand bank against which one end of the structure rested and undermined to a depth of 10 ft. the glacial drift beneath the dam, a considerable section of which was destroyed.

1912—April 8th—Lebanon, Pa. Earth fill without core wall. Failed April 8th. A slip on the outer slope of some 140 cu. yards. This was due to softening by rain. *Engineering Record*, August 24, 1912.

1912—June 22nd—Colorado Springs. Earth fill (disintegrated granite) without core wall. Strong seepage through the dam was followed by caving and slipping of the outer slope. The water had to be lowered. *Engineering Record*, August 24, 1912.

1912—September—Hornell, N. Y. Earth fill with core wall. Partial failure in September, 1912, consisting of numerous leaks through the foundation. The leaks developed in spite of the fact that the core wall had been carried into the rock.

1914—February—Horse Creek Dam, Colorado. Earth fill with concrete facing; inner slope 1:1½, outer 1:2½; 16 ft. wide on top, max. height 65 ft., length 6,600 ft. Probably seepage under dam. 250 ft. went out. *Engineering Record*, Feb. 14, 1914.

1914—February—Washita Dam at Paul Valley, Okla. Concrete core wall was undermined and washed out in February. Structure was about 12 ft. high. The break is 35 ft. long. This is the third time that the power company dam has been washed out. *Engineering Record*, March 7, 1914.

1914—May 2nd—Hebron Earth Dam, New Mexico on the Chico Rico Creek. 3700 ft. long, 56½ ft. high. Failed May 2nd. Water found its way through gopher holes and finally washed out a gap 200 ft. wide and 31 ft. high.

1914—May 26th—Hatchtown Dam. Earth fill 60 ft. high. Reservoir contained 12,000 acre-ft. The wave crest of the water sweeping down the valley was 30 ft. high; destroyed ten or fifteen smaller dams in its path and was finally caught by the Piute reservoir, the level of which was raised 4 ft. Puddle core.

1914—July—Turlock Irrigation District, California. Davis reservoir embankment, 39 ft. depth of water. Water was just turned in. Leakage around outlet structure finally broke earth embankment. Damage \$50,000. *Engineering News*, July 9, 1914.

1914—July 11—Lake George Dam on South Fork of Platte river, 20 miles above Lake Cheeseman. Water found passage between the earthfill and the original surface near one end. Reservoir contained 2000 acre ft. of water. *Engineering Record*, July 11, 1914.

1915—Feb. 1—Mohawk Fishing Club dam, near Tiffin, Ohio, failed twice, March, 1913, and Feb. 1, 1915. Earthfill, 400 ft. long, 18 ft. high. Wooden spillway too small, and flood water washed out large section about midway between banks. When dam was rebuilt a 4-in. reinforced concrete coat was given to both faces and the top. Earthfill settled

and concrete lining broke away. Water then washed the dam out again. *Engineering News*, June 10, 1915.

1918—March—Calaveras Dam, near San Francisco, Cal. Hydraulic fill dam to be ultimately 240 ft. in height; 1300 ft. long. Upstream slope 3:1; downstream  $2\frac{1}{2}$ :1. Middle section of upstream side pushed into the reservoir during construction. Clay core exerting outward pressure towards the bottom due to the great height and softness of same. *Engineering News Record*, April 4, 1918.

## THE HOUSE ORGAN

(The commercial success of any nation as well as any business house depends largely upon the extent and efficiency with which useful business information is distributed. A prominent advertising manager explains here that the house organ is the logical and most effective means of accomplishing this end.—The Editor.)

"Great friendships are never formed except on the basis of mutual benefit. This applies to the relations between the individual and what he reads just the same as it does to personal relations between individuals. By the same token, it applies to the relations between a commercial institution and its customers and prospects. The house organ is merely one effective means of establishing a satisfactory friendship in bulk. That friendship begets confidence and then business."

Such was the declaration of an Eastern advertising manager in addressing the financial advertising section of the advertising convention. He explained that a house organ can do two things: it can build good-will, and can carry a direct selling message. Which elements shall predominate will depend largely upon whether the firm thinks in terms of service or in terms of sales.

In spite of the age and persistence of the house organ idea, there are many who do not believe that this type of publication can be justified as a factor of value in advertising. The chief contention of these critics is that house organs come into being and disappear in considerable numbers every year, and therefore have too great an element of weakness to be relied upon. Their estimates of the house organ death rates are undeniably true but there is considerable doubt about this being a logical reason for not using house publications where there appears to be a logical field for them. Nations rise and fall but no one in his right mind would use that fact as an argument against the nation so-called, as a desirable political unit.

Some one has aptly said that every doctor, lawyer, advertising man, or any other person engaged in similar work should devote a portion of his time to the upbuilding of his profession. Otherwise progress is impossible. By the same token every legitimate business institution should devote some of its time and money to the upbuilding of business. It not only owes this time and money to its customers and prospects individually but to the nation as well. Finally, in speaking of the form which a house organ should take, this advertising manager said that the firm planning to issue one should above all consider a fact which all leading magazines have learned, through actual experience, namely, that a magazine should always be edited largely along lines suggested by its readers.



# Public Utility Rates as Affected by Fluctuating Unit Prices

BY C. E. GRUNSKY

(The dollar is unquestionably worth less today. To what extent should the public utility be allowed an increased return—and should this be reckoned in by substituting replacement costs for original investment or by allowing a larger percentage of return to the power company on the former valuation figures? A radical stand which nevertheless offers a possible practical solution of the difficulty is here taken by an eminent valuation expert.—The Editor.)

The law as interpreted by the courts requires that value be taken into account when the sufficiency of a public utility rate is in question. The public service commissions of the country endeavoring to make value the rate base, now find themselves embarrassed in selecting a proper standard or norm of value. The dollar of course—but the dollar of 1919 when measured in commodity units or by its purchasing power is only worth 43 per cent as much as it was, on an average, during the first decade of this century and only 33 per cent as much as it was in 1896 and 1897.

## Difficulties in Determining Value

When now the question is presented how much it would cost in money to reproduce a plant, such reproduction cost being a more or less dependable index of value, it becomes a perplexing problem to select the unit prices which are to be used in estimating this cost. The reproduction cost is ordinarily wanted as a means of determining or judging value at some particular time. Perhaps, therefore, no more satisfactory unit costs can be selected for introduction into the estimate, than such as are normal at the time to which the valuation is to apply. But, what are normal prices? Those which prevailed during the period of construction may lead to a fair estimate of the investment but they may not be at all satisfactory elements with which to compute present value. Or, if a present or recently past period be selected as one during which the plant could be reconstructed, what date or period of time is to control the price schedule?

The valuation expert is generally inclined to use the average prices which have prevailed for some years prior to the time to which the valuation is to apply. He has not, heretofore, had to deal with such phenomenal price changes as those of the last few years. A five year period has been customary, a ten year or other long, more or less indefinite period has sometimes been taken. If the future trend of prices could be forecast with some certainty the appraiser would no doubt like to make use thereof as a help in determining the momentary normal, because, generally, the established rate base and the rates are to be fixed for some definite or indefinite period in the future. When this is the case, why not accept all prices as momentarily prevailing? This may, theoretically, be sound doctrine but the prices momentarily prevailing are more or less accidental, they are rarely normal, and they are not satisfactory for application to a period of considerable duration such as a year or several years, or even a much longer period which might elapse if reproduction of a plant were actually undertaken; nor are they satisfactory as a forecast for a future term during which the rates based on the valuation are to prevail.

## A Commodity Unit Suggested

The suggestion is ventured, in these circumstances, of a procedure which will be equivalent to the substitution of a commodity unit for the dollar as a standard of value. Suppose, for example, that a price scale applying to any selected period shall have been made the basis of a reproduction cost estimate and that the relation be then found which prices of materials and commodities in general during that period, bear to the prices prevailing at the time for which the reproduction cost is to be estimated. This relation can then be used as a correction factor, and a fair estimate of the reproduction cost will be available for any instant of time or for any duration of time for which the general price index number is available.

This procedure should be generally applicable where any complex plant or system of works and the like is to be valued by the reproduction method. The general commodity index number is fairly representative of relative average wholesale prices and these reflect the cost of labor. As all such valuations are at best only dependable approximations, the error committed by such a procedure will rarely be material except in the cases where, due to special causes, particular materials used in construction are subject to price variations widely at variance with those shown by the general commodity index number. Until there has been a general adoption of a commodity unit to serve as a standard of value, supplementing the dollar whenever the time element enters into consideration, recourse might well be had to separate index numbers for various classes of materials, for labor and for real estate.

## Periodical Modifications of Rate Schedule

Or, looking at the matter from an entirely different angle, may not the value of money be taken into account and be used as the factor to determine periodical changes in the rate schedule? To him who receives the net return resulting from the operation of a public utility, or of any other business, the money he gets has value only to the extent that it is exchangeable for the things which the family needs, food, clothing, shelter, fuel, education, recreation and the like. The best measure at present available of this actual value of money compared with its value at some selected time period, is found in the index number of economists. Why not, then, after rates have once been fixed, make them subject to automatic change, going up or going down at

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The small boy welcomes the scarcity of teachers—let everyone be there to welcome the visitors from the East at convention —

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intervals of about a year according as the value of money, determined by the general commodity index number of the U. S. Department of Labor has gone down or up since the last preceding adjustment? It would be an easy matter to make the index numbers for the last quarter of each year the guide in thus bringing public utility rates into harmony with the purchasing power of money, though it might be

necessary, during a transition period in which recourse to the commodity unit as a standard of value is not universal, to use a modified factor such that only that part of the gross income which is in excess of operating expenses will fluctuate with the index number. The necessity of frequent re-valuation for rate fixing purposes would, under such a procedure, be avoided.

## Office Records—Their Filing and Indexing

BY IRENE WARREN

(A geographic or territorial plan of filing has been introduced into certain lines of business where it has met with unusual success. The president of the Chicago School of Indexing and Filing sets forth here the various methods of employing this plan, explaining in detail how correspondence and all other data can be filed under the main state divisions with city and firm subdivisions.—The Editor.)

In some lines of business, it seems better to arrange the correspondence, orders, credit information, and various other data, according to a territorial or geographic plan. This is an alphabetic arrangement, but three groups of alphabets must be kept in mind—the two geographic divisions and the firm or individual names. One of the following geographic plans is most frequently used.

1. (a) Alphabetic by states, (b) alphabetic by towns, (c) alphabetic by firm.  
     Illinois, Chicago, Carson, Pirie, Scott & Co.  
     Illinois, Waukegan Ingalls, C. B. & Co.  
     Illinois, Waukegan, Smith, R. H.
2. (a) Alphabetic by town, (b) alphabetic by state, (c) alphabetic by firm.  
     Springfield, Ill., Springfield Republican.  
     Springfield, O., Corton Manufacturing Co.  
     Springfield, Mass., Jones Car Co.  
     Springfield, Mo., Atlas Publishing Co.
3. (a) Alphabetic by groups of states, (b) alphabetic by city, (c) alphabetic by state, (d) alphabetic by firm.  
     New England, Boston, Mass., Houghton, Mifflin & Co.  
     New England, Portland, Me., Smith Jewelry Co.
4. (a) Salesmen's routes (named or numbered, not always following a state division), (b) alphabetic by city, (c) alphabetic by state, (d) alphabetic by firm.

The description that follows will be of the first scheme: state, town, and firm. If this is understood thoroughly, it will be easy enough to plan any of the other systems.

The state guides are centered with colored tabs so that the state divisions may be seen readily when more than one state is filed in a drawer. Back of each state guide, the cities are arranged alphabetically. Tabs in the first two positions to the left are used, the city name is printed in large clear black type, and in some cases it is advisable to have the population of the city printed on the guide also.

The regular correspondents' folders follow with the tab at the extreme right bearing the name of state, town and firm. Color schemes may be worked out with the labels in the same style as described in the alphabetic arrangements. The position at the left of the regular correspondents' folder is free for any special guides that are needed from time to time. Sometimes this will be a metal-tip guide with the name of the customer whose correspondence is used constantly, so that the clerk's eye may fall on the exact place where this correspondence is located, the

minute that the drawer is opened. Sometimes it is a set of alphabetic guides for the 26 letters of the alphabet, or the 12 months guides. Every labor-saving device of this sort is placed in the file, and every device that will make for speed and accuracy.

### Miscellaneous Correspondents

As miscellaneous correspondents develop for a given town, they are alphabetically arranged in a colored folder which has a tab bearing the name of the state and town. These are inserted as they are needed and are always filed back of the regular correspondent's folders for a given town.

Every firm that sells filing systems has a geographic system. They differ slightly in the position of tabs and a few minor points. A customer may order whatever is needed in geographic guides, as for instance, all cities with a population over 5000 in Illinois, Indiana, Ohio, Michigan, and Wisconsin, or he may order all towns in Illinois only.

The letter should be clearly marked for filing when it is first read. The state and town are so obvious that it is unnecessary to underscore these names, but the individual's or firm's name should be underscored.

### Cross References

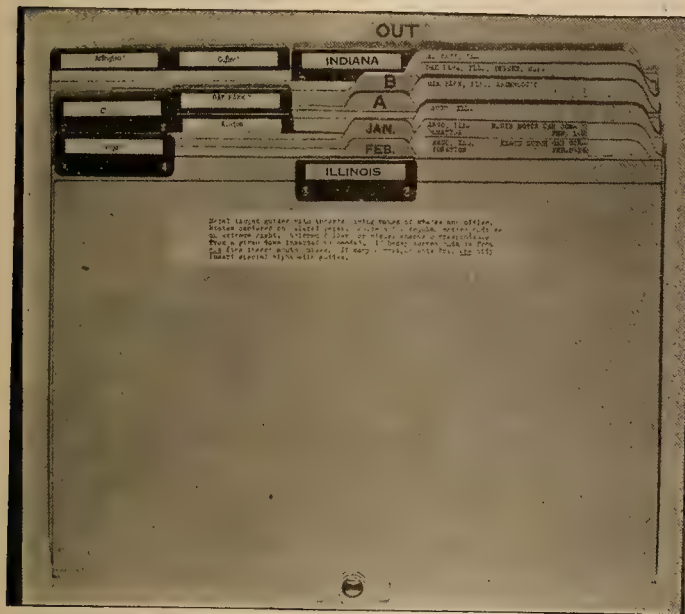
The cross references for this system are somewhat more difficult to handle. As before stated, we must be able to make cross references under name, subject or geographic location. The latter will readily find its alphabetic place in the folders of either the regular or the miscellaneous correspondents. But our states are not guided by alphabetic guides and some letters, such as B, are not even represented. To meet this difficulty, some firms have introduced at the extreme left a distinctive large, colored guide for the 26 or more divisions of the alphabet, according to the size of the file. For the subject and name cross references, a stiff, colored cardboard, the size of the folders, with a tab marked "Z reference" and space for words to follow, is ruled to meet this need. In the small file, one of these is inserted for each letter of the alphabet; in the large file as many as are needed are used, sometimes one for each cross reference made, so that they may be placed exactly where they belong in the alphabetic scheme and thus no chance of a mistake is made.



If subject and names develop sufficient correspondence to have a folder of their own, this alphabetic gilding makes it possible to insert such folders exactly where they belong in the one straight alphabetic scheme:

Alabama  
Alaska  
Applications — Bookkeepers  
Applications — Stenographers  
Arkansas

In firms using a geographic plan, there is usually a card index record, perhaps a mailing list,



In the geographic file, states determine the main divisions, while cities, then firms or individuals, determine the respective subdivisions.

alphabetically arranged by firm names, which helps to locate the occasional name that is needed when the location is unknown.

In setting up any system, all papers must go in one of two folders—the regular correspondent's folder, or the miscellaneous correspondent's folder. If information will not by its very nature go into one of these two folders, or be treated as they are treated, then it is always necessary to resort to the correspondence-sized card ruled for the purpose, or the tab part of a regular correspondent's folder bearing a large gilt star may be inserted in its regular alphabetic sequence.

Many firms that divided their correspondence or cards by states because they thought they could handle small divisions more easily than large ones, are arranging the towns from the various states in one straight alphabetic arrangement now that they can get such good sets of alphabetic division guides.

Maps frequently supplement geographic files to splendid advantage and make information available at a glance. Wall maps or sectional maps filed flat in shallow drawers are used, on which are placed colored pins to indicate work done in a given city. Salesmen's routes are followed by pinning on colored yarns in the same fashion as lines of progress were marked during the war.

#### Street Filing

It seems best to add a word here regarding street filing, although it is confined to card indexes.

Public utilities—gas, electric light, and telephone companies—must keep such indexes. The names of the streets are arranged alphabetically, in one or two positions at the left, the numbers of the buildings are arranged consecutively under each street; if offices, apartments or some other division is to be made, this forms a third subdivision. In guiding a file of this sort, the alphabetic guides for streets are kept at the left. The street numbers are guided by five positions of guides bearing hundred subdivision (100, 200, etc.), staggered in five or ten positions in the center, and the room numbers are on another colored set of guides at the right. The three divisions are thus so clearly marked that accuracy is assured.

#### DEALERS' HELPS

(The dealer knows what arguments for and against his goods will appeal to his customers, therefore dealers' helps should be planned in connection with the dealer himself. Both the manufacturer and the dealer will profit through cooperation in this work. —The Editor.)

Retail merchants of the progressive type are willing to pay a part of the cost of producing "dealer help" literature, and other helpful supplemental advertising matter prepared by the manufacturer to help the retailer sell his product. An Eastern sales and advertising manager in addressing the Direct Mail branch of the Associated Advertising Clubs says: "Remember that the progressive dealer is not one who accepts anything and everything that is given to him, but the one who makes the best use of the assistance and service offered to him. Surround your advertising and selling helps with what I would term 'atmosphere,' which will place them above the common level, and make them somewhat difficult to secure. I have no doubt but that it will require tact and judgment to bring every dealer to a common point of view, but if these suggestions are carefully considered in planning the dealer helps of the future, I am convinced in my own mind that the average dealer will be glad to respond to our requests to assume a part of the burden of the cost."

It was brought out further that the average dealer is alive to the necessity of using intelligently the selling helps offered by most manufacturers, but the trouble has been that too many selling helps have been prepared and distributed without first acquiring a reliable knowledge of the actual needs of the dealer. If it does one thing, the present increased cost of materials used in the manufacture of selling helps for dealers will not be an evil unmixed with good. If manufacturers generally can see the necessity of supplying fewer and better helps to their trade and succeed in making the dealer see the value in their intelligent use, the present conditions will have aided materially in increasing the efficiency of an important part of the entire selling plan.

When the schoolmaster sits on a tack, he arises—so much of importance will arise at the Pasadena conventions that you will want to be there—

PASADENA — MAY 17-21, 1920



## SPARKS—Current Facts, Figures and Fancy

(Facts that you should know on Oriental trade, as well as bits of information on the San Francisco harbor, the latest known use of Epsom salts, the utilization of corn cobs and the introduction of paper clothing appear on this page.—The Editor.)

While the present waterfront line of San Francisco in active use is approximately five miles in length, it comprises 15,000 feet of completed sea wall, about forty piers with about fifteen miles of berthing space and about five million square feet of pier area.

\* \* \*

Holes bored by crawfish in the earthen wing-dam diverting the waters of the Deschutes river through the Bend, Oregon, power plant, are considered responsible for a washout which occurred a short time ago. The repairs will cost the company several thousand dollars.

\* \* \*

Corn cobs, one of the largest waste by-products of farming, may now be utilized as the result of processes which have been worked out and patented for the preparation from corn cobs of adhesive gum and of the rare sugar xylose into substances which may be useful commercially.

\* \* \*

In Mexico during the past year 15 new telegraph offices have been opened for public use. The number of messages sent and received total 12,102,286. There have been 1,879 km. of new lines constructed. The extent of the telegraph system of the Republic at the present time is 87,117 km.

\* \* \*

A plan is reported in the Japanese Weekly Chronicle for chartering a steamer of 10,000 tons, remodeling it into a suitable show place for Japanese products, and sending it around the world. At each foreign port at which the ship stops, representative citizens will be invited on board and made more familiar with Japanese merchandise.

\* \* \*

It is reported that two British inventors have succeeded in producing a device whereby it is possible to dictate a message into a telephone receiver at one end of a wire, and at the other end an automatic recorder inscribes the message on a gramophone record for later reproduction. The blurring or metallic tone effect is said to be practically eliminated.

\* \* \*

A road of Epsom salts is an attraction Texas can soon hold out to tourists. Ten miles of road are being surfaced with a material which analyzes more than one-fourth Epsom salts. The material is obtained from flats where constant evaporation of gulf water has left silt strongly impregnated with salts, among which the Epsom variety predominates. The mixture forms an excellent road surfacing material.

The London Times states that the Chinese Government, with a view to developing commercial aviation, has entered into a contract with Vickers (Ltd.) for the supply of a large number of Vickers-Vimy commercial airplanes. To meet the cost of the purchase of machines, construction of airdromes, repair depots, and administration, the Chinese Government is making an issue of £1,800,000 (approximately \$9,000,000) in treasury notes, all of which sum is to be expended in the development of commercial aviation.

\* \* \*

The first shipment of cotton to a foreign port direct from the harbor of Los Angeles was made when the "Crown of Galicia" took on 800 bales of the Imperial Valley product for delivery to Liverpool. The overseas consignment of the Southern California product was made possible by the high density compress recently installed at Los Angeles harbor. It is municipally owned and of the most modern construction. California's cotton crop was worth \$20,000,000 this year.

\* \* \*

Being caught in a rainstorm is not in itself a particularly alarming thing, but if you are wearing a paper suit the state of the weather is rather important. For lack of proper supplies paper clothing is in general use in Bosnia and Croatia—a fact which accounts for a recent story of an Austrian prince whose paper suit began to disintegrate in a heavy shower. He borrowed a suit from a British soldier while his own was drying, but unfortunately the paper garment blew against the stove and was cremated instead of dissolved.

\* \* \*

A comparison of performance of the motive power of the "New Mexico" with that of other battleships shows marked economy in favor of the electric drive. At 12 knots' speed, the consumption in tons of oil per day was 75 tons for the "New Mexico" as compared with 100 tons for the cruising turbines and 118 tons for the main turbines of the "Arizona, and with 99 tons for the cruising turbines and 115 tons for the main turbines of the "Mississippi." At 19 knots, the consumption of the "New Mexico" was 263 tons, of the "Mississippi" main turbines, 305 tons, and of the "Idaho" main turbines, 310 tons per day.

\* \* \*

Estimated production of 370,000,000 barrels of oil in 1919 in the United States, or two-thirds of the total output, emphasizes the relation of the oil industry of this country to world industries. The United States has produced 57 per cent of the world's total output of 7,000,000,000 barrels since 1859.



## PERSONALS

Eugene A. Roberts has been elected president of the New Mexico Electric Association, which is to be expanded and enlarged to include the states of Colorado and Wyoming. These states form a logical grouping and their problems are mutual. Mr. Roberts has been active in association affairs and his enthusiasm and energy made him the natural and inevitable choice for president. He has been connected with The Public Utilities Company of Carlsbad, New Mexico, since graduating from the New Mexico Military Institute in

1912, and is now the manager of that property. The Association looks forward to an active year of work under his able guidance.

C. H. Bromley, associate editor of "Power," has returned to New York after his western trip.

A. G. Balch of Los Angeles was a recent visitor in San Francisco. Mr. Balch is the president of the San Joaquin Light and Power Corporation.

Herbert J. Flagg, chief engineer of The Public Service Commission of Washington, recently visited San Francisco in connection with commission matters.

J. F. B. Regensburg, chief of the dredging department of the Netherland East India Government, with headquarters at Weltevreden, Java, is a recent San Francisco visitor.

George E. Quinan, chief electrical engineer for the Puget Sound Traction Light & Power Co., of Seattle, is again at his desk after an illness covering several weeks' duration.

L. G. Hinwood, electrical engineer for the Australian General Electric Company, is a recent visitor at San Francisco. He left on the S. S. Ventura February 17, 1920, for Sydney.

J. Muirhead has been appointed Inspector of Electrical Energy for the Province of British Columbia, to succeed D. P. Roberts, who has resigned. Mr. Muirhead has been assistant inspector for five years.

Harold G. Cloud, with the Holabird Electrical Company of San Francisco, has resigned to accept a position as sales engineer with the Island Investment Company, Ltd., of Maui, T. H. Mr. Cloud leaves for the Hawaiian Islands during April.

Albert C. Crehore, the noted physicist who is contributing the interesting articles now appearing serially in the columns of the Journal of Electricity, entitled The New Physics, has just been engaged on important research work at Nela Park, Cleveland, Ohio.

H. P. Gibbs and wife of India have been stopping in San Francisco on their way to the eastern part of the United States. Mr. Gibbs is chief engineer and general manager of the Tata Hydroelectric and Andhra Valley Power companies. Since 1913 he has been a Fellow in the A. I. E. E.

W. G. Watson, managing director of W. G. Watson & Company, Ltd., electrical engineers and merchants of Sydney, Australia, will arrive at San Francisco shortly on his way to England on business in connection with his company. Any manufacturers or others desirous of getting in touch with Mr. Watson can address letters to him in care of the Journal of Electricity. Mr. Watson expects to be a few weeks in America working his way across to New York.

F. W. Peek, Jr., consulting engineer for the General Electric Company, and a well known authority on high tension phenomena, is spending his vacation in California, his former home. Mr. Peek spent several days in San Francisco conferring with the staff of the General Electric Company there.

J. S. Andrews, general sales manager for the Domestic Electric Company of St. Louis, Missouri, is a Salt Lake City visitor. Prior to Mr. Andrews' connection with the above company he was for a number of years prominent in the electrical merchandising department of the Commonwealth Edison Company of Chicago.

Jas. H. Bonner, chief engineer of the Montana Railroad Commission, has returned to Helena after a hurried visit to the recently discovered oil fields in eastern Montana. Mr. Bonner is preparing an interesting article for the Journal of Electricity on the power situation in Montana, which will appear in the issue of May 15, 1920.

O. B. Coldwell, second vice-president of the Portland Railway Light & Power Company, has returned north after his recent delightful visit to various California cities, and has just visited Seattle in the interest of arousing even more enthusiasm in attendance from the Northwest at the Pasadena Convention of N. E. L. A., May 18-21, 1920.

R. M. Alvord, San Francisco manager of the supply department of the General Electric Company, has returned from an Eastern visit of several weeks, where he went in the interest of spreading the message of more extensive use of the convenience outlet in the building of houses, agreeable to Garnett Young's paper on this subject which appeared in the Journal of Electricity February 15, 1920.

Frank B. Rae, electrical and mechanical engineer of Cleveland, Ohio, is a recent visitor in the West. Mr. Rae was connected in 1881 with the first electric utility of the United States, the California Light Company, which had a steam plant in San Francisco, and he has ever since been in the electrical business. He was also one of the charter members of the American Institute of Electrical Engineers.

R. H. Ballard, vice-president of the Southern California Edison Company and president of the National Electric Light Association, has returned to Los Angeles from an unusually successful trip to the East in arousing enthusiasm for the forthcoming convention of the association to be held at Pasadena May 28th to 31st, 1920. In New York and on down the Atlantic Coast and Gulf Coast states, Mr. Ballard held a number of helpful meetings. Through Texas and New Mexico these meetings continued to meet with enthusiasm.

E. H. Le Tourneau, electrical engineer with the Portland Railway Light and Power Company, has resigned to accept a position in New York with the Bureau of Construction and Repair, Division of Operation, of the U. S. Shipping Board. Mr. Le Tourneau had been with the Portland Railway Light and Power Company since 1910 in various capacities, including those of superintendent of the Oregon City hydroelectric plant, assistant engineer, office manager of the commercial department, and efficiency engineer. Previous to this time he was employed by the New York Central & Hudson River Railroad Company on electrification work.



Pharaoh's daughter found a little prophet in the bulrushes—  
you will find much of profit in the spring conventions—

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A. H. Halloran, formerly assistant business manager for the Journal of Electricity, has been made Pacific



Coast Representative of the McGraw-Hill Book Company of New York City. In the future Mr. Halloran's duties will be two-fold, in that he will have to do with the production end of books in the territory west of the Rockies, and also with the editing of books and the visiting of Western universities and colleges interested in the publication and use of books. Mr. Halloran has a wide experience in the publishing business

and a broad acquaintance among engineering and scientific men throughout the West. The McGraw-Hill Book Company was established in 1909 as a combination of the McGraw Book Company and the Hill Book Company. During the past ten-year period its business has grown to such vast proportions that the need of a Pacific Coast representative is considered evident. The best of good wishes are heard on every side for Mr. Halloran in this new work which will be of real service to the West.

C. H. Crawford, manager for the Baldwin Locomotive Works of Rio Janeiro, will become the South American representative of the American Association of Engineers on May 11th.

R. E. Collom, petroleum technologist of the U. S. Bureau of Mines, has changed his headquarters from San Francisco to Dallas, Texas, where he will be in charge of the Bureau's office at that point.

Harris J. Ryan, professor of electrical engineering at Stanford University, will give an unusually interesting paper before the San Francisco Section, A. I. E. E., the latter part of March, on super-sonic research investigations which have vastly forwarded submarine transmission of intelligence.

A. V. Guillou, of the engineering department, Southern California Edison Company, has been appointed assistant engineer, gas and electrical division, of the Railroad Commission. Mr. Guillou graduated from the University of California with the class of 1912 and spent the two following years with the Westinghouse Company in Pittsburgh. Following this he joined the organization of the Pacific Light and Power Corporation. When the latter purchased Mt. Whitney Power and Electric Company, Mr. Guillou became district agent at Porterville. Later he was transferred to the engineering department of the Edison Company.

R. D. Compton has been chosen secretary-treasurer of the San Francisco Electrical Development League, by unanimous vote of the directors. One of his first activities will be the preparation of a photographic roster of the League membership, which is expected to reach 300 by March 1st. Mr. Compton is with the Valuation Department, Pacific Gas & Electric Company, San Francisco.



Renzo Norsa, an electrical engineer from Milan, Italy, who visited various engineering centers of the Pacific Coast during 1919, has returned to his native country to become general manager of the Societe Elettrica Interregionale, with headquarters in Milan.

E. M. Cutting, formerly Pacific Coast representative of the Edison Storage Battery Company, is now with the H. H. Franklin Manufacturing Company of Syracuse, N. Y., manufacturers of the Franklin Motor Car. Mr. Cutting is looking for a number of able and experienced men, preferably along the lines of mechanical engineering and such other kindred lines as they may have taken up or in which they have had considerable experience since leaving college. The many friends of Mr. Cutting in the West send him congratulations over his new position and wish for him every success.

E. M. Herr, president Westinghouse Electric & Manufacturing Company, with headquarters at East Pittsburgh, is a recent San Francisco visitor. Mr. Herr has been long prominent in the engineering world. Previous to his connection with the Westinghouse Company he was superintendent of motive power for the Northern Pacific Railway. In 1898 he became general manager of the Westinghouse Air Brake Company and in 1911 became president. Since that time he has become president of the Westinghouse Electric & Manufacturing Company as well as vice-president of several other electric companies and director of the East Pittsburgh Savings and Trust Company. Mr. Herr is a member of the A. S. M. E., A. I. E. E., and of the American Civic Federation. He is now on his way to Japan where he will investigate trade conditions.

#### N. E. L. A. APPOINTMENTS

The reorganization plans at National Electric Light Association headquarters, which are intended to increase and better the service rendered to member companies, have been furthered by the addition of Fred W. Herbert, as superintendent of the service department, and George F. Oxley, as director of the publicity department. Both of these men are of the West, where Mr. Herbert was chief statistician for the Colorado Public Utilities Commission, and Mr. Oxley manager of the Mountain Division of the American Red Cross.

Mr. Herbert is a trained accountant, a practical rate man, and has been closely associated with state regulation, accounting, and statistical work. Prior to his appointment as chief statistician of the Colorado Public Utilities Commission, five years ago, he was connected with Western utilities for many years as secretary and auditor. Among other matters he will assist in promulgating and interpreting the uniform classification of accounts established by the National Electric Light Association for all electric utilities, and have charge of rate research and general statistical service for member companies of the Association.

Mr. Oxley's work, as director of publicity, will supplement that of the National Committee on Public Information and the Advertising and Publicity Service Bureau, and will comprise supervision of the National Association Magazine, the promulgation of a plan of national publicity in the interests of the electrical industry, and the organization of public information work throughout the country. Mr. Oxley received his newspaper training on Worcester and Boston newspapers, and in later years has been special writer on newspapers in the West.

#### OBITUARY

W. R. Baker, president of M. C. Baker & Son, an electrical supply house, died recently at his home in San Francisco.

A. S. Armstrong, for over twenty-five years private secretary for R. J. Davis, passed away on March 7, 1920, after a lingering illness. Mr. Armstrong, known to all the trade as "Billy," became identified with the electrical fraternity as a clerk in the office of the Edison Light & Power Company, San Francisco, in 1892.



## Meeting Notices for Electrical Men

(At the Del Monte meeting of Western Electrical Supply Jobbers, the usual enthusiasm was shown both over business and golfing activities. A noteworthy meeting of Honolulu electrical men is reported as well as interesting meetings in the Northwest states and in southern California.—The Editor.)

### Pacific Division, National Electrical Supply Jobbers Association

The quarterly meeting of the Pacific Division of the National Electrical Supply Jobbers Association was held at Del Monte, California, Feb. 26, 27 and 28, 1920.

The open meeting of the association, held at the Del Monte Hotel during the afternoon of Feb. 28, proved unusually interesting. C. B. Hall, general manager of the Illinois Electric Company, with headquarters at Los Angeles, presented a paper on the present business outlook. The paper of Mr. Hall sketched the financial situation as it appears to the jobber today and offered certain prognostications for the future. In a discussion which followed it was developed that sane business endeavor, taking each day as best one can, is after all the only sure way of preparing for the future, which no one at present can definitely foretell. The paper brought forth unusually lively discussion in which the point was brought out that the jobbing industry, as well as other branches of the electrical industry, should do everything possible to assist central station financing in the West at the present time and encourage employes of the various jobbing houses and other employes in the industry to show confidence in the outlook by investing in these securities, which are beyond the question of a doubt of of very high standing.

In the golf tournament W. M. Deming, Pacific Coast general manager of the McGraw-Hill Company, won the Turner trophy, while R. A. Balzari, of the Westinghouse Electric & Manufacturing Company, won the Manufacturer's cup. Mr. Balzari keeps the trophy permanently, as this is the third occasion on which he has won it. To R. D. Holabird, of the Holabird Electrical Company, went the famous Jobbers' cup. O. B. Stubbs of Portland acted as toastmaster at the evening banquet, and in his usual quiet and forceful manner brought out many interesting and amusing incidents connected with the jobbing industry as well as that connected with the playing of golf.

Those present at the meeting were as follows:

G. H. Curtis, sales manager, Electric Railway & Mfrs. Supply; W. M. Deming, Pacific Coast general manager, McGraw-Hill Company; A. H. Elliott, secretary Electric Supply Jobbers' Association; N. W. Graham, Graham-Reynolds Electric Co., Los Angeles; C. G. Gauntlett, Pacific Coast representative, Safety Insul. Wire & Cable Co.; W. H. Green, representative, Chicago Fuse Mfg. Co.; S. B. Gregory, Pacific Coast representative, Arrow Electric Co.; C. C. Hillis, vice-president and general manager, Electric Appliance Co.; D. E. Harris, vice-president Pacific States Electric Co.; R. D. Holabird, Holabird Electric Sign Co.; C. B. Hall, secretary and manager, Illinois Electric Co.; E. E. Arnold, manufacturer's representative; J. H. Jamison, Westinghouse Electric & Mfg. Co.; C. E. Listenwalter, Listenwalter & Gough; F. H. Murray, National Carbon Co.; R. F. Oakes, National Carbon Co.; R. S. Prussia, Westinghouse Lamp Co.;

Albert Rives, representative of North Coast Electric Co.; O. B. Stubbs, Stubbs Electric Co., Portland; H. E. Sanderson, Pacific Coast representative, Bryant Electric Co.; H. B. Squires, H. B. Squires Co.; Robt. Sibley, editor Journal of Electricity; Miles Steel, Pacific Coast representative, Benjamin Electric Co.; J. A. Vandergrift, Pacific Coast manager, National Lamp Works; W. C. Wurfel, Westinghouse Lamp Co.; Roy Worth, representative of Pacific Coast Electric Co., of Seattle; C. E. Wiggins, manager electric department, Dunham, Carrigan & Hayden; Garnett Young, Garnett Young Co.; E. A. Hunt, Pacific Coast manager Robbins & Myers Co.; W. S. Dunbar, Westinghouse Electric & Mfg. Co.; R. A. Balzari, Westinghouse Electric & Mfg. Co.; H. W. Turner, president Montana Electric Co.; W. B. Sawyer, Jr., U. S. Steel Products Co.

### California Electrical Cooperative Campaign

At a meeting of the Salesman's Auxiliary of the California Electrical Cooperative Campaign, H. W. Angus, secretary of the organization, showed the effects of the intensive

advertising campaign that had been launched in the last six weeks of 1919. A gain of 5,119 advertisements amounting to 81,161 column inches in 1919 over the same period of 1918 had brought in a gain of 68,152 sales, or 62%, in figures compiled from reports sent in by sixteen jobbers. The largest increase in sales of one appliance was in the electric washing machine, which had increased over 400%. Figuring an average cost of seventy cents an inch for advertising space, the total cost of advertising to reach this great gain was \$79,454, and the publicity given to the campaign amounted to 49 pages.

The duties assigned at present for 1920 by the Advisory Committee are:

1—To introduce the standard and simplified accounting systems.

2—To emphasize the importance of subscribing to and reading electrical trade journals, especially the Journal of Electricity, Electrical Merchandising and the Electrical Contractor-Dealer.

3—To point out the necessity that all buildings wired have sufficient and proper outlets for the use of electric appliances.

4—To secure the closest cooperation of the jobbers and manufacturers with the two other branches of the industry—the power companies and contractor-dealers.

5—To assist the field men in securing membership from non-members in the California State Association of Electrical Contractors and Dealers, and encouraging all contractors and dealers to take an active part in their sections and locals and other association work.

Figures on the building now under way in California showed that if, in the 130,000 homes required, twenty outlets were installed instead of the one which used to be put in, it would mean a possible outlet business to the contractors of \$12,350,000. The average value of appliances in the home is \$150 out of a possible \$750, which would mean that if every new home in California were made a truly electrical home it would bring about a sale of \$97,500,000 worth of appliances.

The presidential candidates promise to attend to the high cost of living—promise yourself now that you will attend convention —

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### BUILDERS OF THE WEST — LXXIII



S. L. SHUFFLETON

That the erection and completion of vast hydroelectric installations and transmission lines continue to mark progress in the West is an indication of the healthful growth of a region foremost in development along lines of engineering achievement. To S. L. Shuffleton, at present in charge of construction on the Caribou Plant of the Great Western Power Company, and whose part in the conception of design and in the successful carrying out of the installation did much to make possible the highest voltage long distance transmission line in the world, this issue of the Journal of Electricity is affectionately dedicated in lasting acknowledgment of his substantial contribution to Western progress.



Mr. Angus further pointed out the need of convenient outlets, for in homes where they were not provided 60% of the appliances stayed on the shelves, but where outlets were provided 97% of the appliances were in everyday use.

The fact was brought out that the salesmen of the various manufacturers and jobbers were not doing anything toward helping the Cooperative Campaign, and so to educate them and teach the idea of the campaign a meeting will be held on April 2, at which all of the outside salesmen of the manufacturers and jobbers will be present. The result of such a meeting will be that the dealer in the small towns will be brought to see the great benefits to him of the campaign and to make him join in the cooperative spirit because he believes in it as necessary to the greatest good of the electrical industry and to the people of the State of California.

#### Ladies' Day at Development League

As might be expected, Ladies' Day proved to be a most successful meeting of the San Francisco Electrical Development League. The High Cost of Living was the topic of the day and was particularly well chosen since it is one as vital to the ladies of electrical men as it is to the men themselves.

Mrs. Annette A. Adams, the speaker, was introduced by Clotilde E. Grunsky, associate editor of the Journal of Electricity. Miss Grunsky delighted members and guests with a humorous philosophy on the subject in hand which put all in an excellent frame of mind for H. C. L. discussion, tragic as it might be.

Mrs. Annette Adams is a United States attorney and her wide experience in dealing with this problem put her in a position to present it in a new light. She emphasized, particularly, the fact that the consumer can do much to relieve the present day situation by personally diminishing the demand made upon manufacturers, wholesalers and dealers.

In addition to these talks, all retiring committee chairmen gave snappy reports of their past year's work.

#### Oregon Section, A. S. M. E.

The Oregon Section is one of the youngest local sections of the A. S. M. E., having been authorized on October 25, 1919. Its territory embraces all of the state of Oregon and the part of the state of Washington within a radius of thirty miles from the Portland City Hall, thus including the city of Vancouver, which, although in Washington, is really tributary to Portland in an industrial sense.

#### The officers are:

Chairman: Mr. B. C. Ball, president Willamette Iron and Steel Works.  
Secretary: Dr. E. W. Lazell, consulting engineer.

Relations to other societies are covered by the following statement:

"A joint council of the engineering interests of Oregon has been formed whereby each of the local sections of the national societies have two representatives for the first fifty members of their respective organizations, and one representative for each hundred members thereafter. This joint council will act in state and municipal matters concerning engineering activities. There are at present seven or eight organizations entitled to membership in the joint council."

Several of the members of the Section are actively interested in a committee for industrial and scientific research recently formed at the Oregon State College, and it is probable that this committee will be made the clearing house for any problems that may present themselves. The Section delegate is chairman of this committee and on behalf of the Section solicits all possible assistance from the Research and Standardization Committees of the Society.

It is the desire and intention of the Section to take active part in all matters of civic interest. This can probably be done most effectively through the Society's representatives on the Joint Council.

#### Joint Meeting of Los Angeles Engineers

A joint meeting of the Los Angeles sections of the American Institute of Electrical Engineers and the American Chemical Society was held in the Los Angeles City Club on the second of March. Dr. Robert A. Millikan of the University of Chicago, who is now giving part of his time to the California Institute of Technology in Pasadena, gave an address on the recent developments in physical research.

Doctor Millikan has spent two years as research director of the National Research Council. His talk contained many noteworthy statements. In discussing the absence of corona in high vacua the Doctor stated that transmission lines in the future might consist of conductors in long vacuum tubes and further, in referring to recent telephone achievements he said, "The pure science of today is the applied science of tomorrow."

In speaking of the patience of investigators, Doctor Millikan said, "Science advances by small steps—a bit here and a trifle there—contributions to the field of knowledge which in the aggregate mark real progress. There are few big discoveries. Often what is known to the layman as a big discovery is merely the publication of details coming from a number of contributors and frequently the man who receives credit is no more worthy than some of the others whose bit made his so-called discovery possible."

The lecture was illustrated by lantern slides of spectra taken in the region lying between the violet and the X-ray, a portion of which to this time has not been investigated. Slides were shown of spectra, taken by means of gratings, which overlap the area of the X-ray.

#### Meeting of Honolulu Dealers

The Honolulu Commercial Club was a scene of gay festivity when the electrical dealers of the city gathered at an informal convention and dinner for the purpose of creating greater interest and cooperation in the sale of electrical goods locally. A novel idea for an extensive sales campaign whereby local housewives will have an opportunity of witnessing practical demonstrations of the latest labor saving devices was graphically portrayed by the appearance of several young women representing the "Poor Man's Wife," "Mrs. Well-To-Do" and the "Servant," who effectively demonstrated the plan for eliminating the servant problem. The climax was reached when the goddess of "Household Liberty," crowned in electric lights, emerged from a washing machine, which until then had appeared as an inanimate piece of mechanism. The dinner was enjoyed by more than 40 representative business men, for whose entertainment a novel musical program was given.

Interesting talks on the subject of cooperative work were made by C. A. Langlais, a prominent contractor of San Francisco; A. S. Hayward, sales manager for Catton, Neill & Co.; J. C. Blair of the Island Electric Company of Maui, and J. R. Cox, Westinghouse representative, who were guests of the occasion.

#### A. I. E. E. and N. E. L. A., Portland Sections

The regular monthly meeting of the Portland Sections of the N. E. L. A. and the A. I. E. E. was held in the University Club auditorium on March the ninth. Mr. W. H. Crawford, manager of the Department of Industries of the Portland Chamber of Commerce, reviewed the "Industrial Development of the Portland District." This subject so closely related to the future welfare of the public utilities of that city, was of vital interest to these men of the industry.

#### American Association of Engineers, Astoria

The local chapter of the American Association of Engineers at Astoria elected the following officers at a recent meeting: R. R. Bartlett, president; A. S. Tee, first vice-president; L. C. Rogers, second vice-president; G. T. McClean, secretary; H. N. Hackett, treasurer.



## Plans for N. E. L. A. Convention

(Eight weeks from now thousands of electrical men from all over the nation will be on their way to the Pasadena Convention. A score of capable committee chairmen are now busy making arrangements for golfing, auto rides and banquets, as well as for regular convention sessions. A schedule of the four star evenings and a list of the committee chairmen are given below.—The Editor.)

Now that committee chairmen have been appointed by the N. E. L. A. Convention chairman, John B. Miller, definite plans are being made which cover every phase of the convention program. A feature event has been scheduled for each of the four evenings. On Tuesday night a reception will be held in honor of the N. E. L. A. president, R. H. Ballard, at the Hotel Huntington. On Wednesday night the celebrated Mission Play will be given. This play, which re-enacts the olden days in California, is well known as a special California feature and will undoubtedly come up to all expectations in being a truly interesting and instructive production.

Thursday night has been given over to the Public Policy Committee which is planning to hold an open meeting of interest to all delegates. On the last night of the Convention, the big banquet will be held at the Maryland Hotel under the auspices of the Pacific Coast Section of the N. E. L. A. This will certainly be a great success since it is being arranged by Emory Wishon, president of the Pacific Coast Section. The famous Mack Sennett bathing girls are scheduled as part of the evening's entertainment. Arrangements are being made to accommodate two thousand guests.

The convention of the Pacific Coast Section of the N. E. L. A., which is to be held in the two days just preceding the National Convention, will take place, mainly, at the Green Hotel, Pasadena. Headquarters will be maintained both at the Hotel Maryland and at the Huntington Hotel of that city.

An effort is being made to have all of the California delegates drive to the convention in their automobiles so that there will be a sufficient number available for transporting convention guests to nearby points of interest.

The committee chairmen have been announced as follows:

A. E. Morphy, Vice Chairman  
George W. Elliott, Master of Transportation  
S. M. Kennedy, Program  
W. H. Aylesworth, Registration  
A. B. Wollaber, Hotel Committee  
A. N. Kemp, Finance  
W. L. Frost, General Chairman Entertainment  
C. S. Walton, President's Reception  
A. E. Wishon, Pacific Coast Section Meeting  
K. E. Van Kuran, Ladies' Committee  
J. W. Burns, Golf Committee  
R. J. Cash, Dancing  
C. H. Coulter, Motion Pictures  
E. R. Davis, Power Plant Inspection  
B. F. Pearson, Catalina and Coronado Trips  
P. H. Ducker, Local Transportation  
C. M. Masson, Illumination  
C. H. Pierson, Publicity  
F. B. Lewis, Auto Rides  
C. S. Vance, Whips  
H. N. Sessions, Farewell Committee

### PACIFIC NORTHWEST PLANS

Electrical leaders of the Northwest are determined that a very large delegation from the Pacific Northwest states shall appear at the Pasadena convention. A special effort is being made to secure the attendance of as many electrical contractors and dealers as possible. Patrons of the cooperative plan believe that if a good-sized delegation of contractor-dealers can accompany the central station and manufacturer representatives to this convention and see how the plan works in California, a big step will be taken in accomplishing desired results in the Pacific Northwest.

Further, the contractors and dealers will get, at Pasadena, first-hand knowledge of the problems facing the central stations which can be secured in no other way.

The fact that electrical contractors and dealers have not heretofore held membership in the N. E. L. A. should in no way detract from the representation of this branch of the industry. If the purpose of this national convention is to be accomplished, all branches of the industry and all sections of the country must be adequately represented.

### PACIFIC COAST SECTION N. E. L. A. CONVENTION PROGRAM

Following is the program which has been arranged by the Pacific Coast Section of the National Electric Light Association for the convention at Pasadena, immediately preceding the National Convention:

May 18th

- 9:00 a.m. General Session—Opening Meeting  
President's Address—A. Emory Wishon  
Secretary's Report—A. H. Halloran  
Treasurer's Report—J. F. Pollard  
Report of Committee on Cooperation—T. E. Bibbins  
Report of Membership Committee—Harry N. Sessions  
Report of Publicity Committee—L. W. Alexander  
Appointments of Committees  
Announcements
- 10:00 a.m. Accounting Committee Session—P. R. Ferguson, Chairman
- 10:00 a.m. Commercial Committee Session—K. E. Van Kuran, Chairman
- 10:00 a.m. Engineering Committee Session—P. M. Downing, Chairman
- Noon. Executive Committee Session
- 1:30 p.m. General Session—Papers to be discussed:  
"Railway Electrification," by J. E. Woodbridge  
"Commercial Aspects of Railway Electrification," by E. B. Criddle
- 2:40 p.m. "Cooperating with Architects and Builders," by Garnett Young  
"Value of Solicitors," by A. W. Childs  
"Un electrified Horsepower," by J. O. Case  
"Standardization of Wiring Devices and Methods," by H. H. Courtright  
Report of California Electrical Cooperative Campaign Committee—L. H. Newbert
- 4:30 p.m. Closing Business Session  
Report of Resolutions Committee  
Unfinished Business  
Report of Nominating Committee



A snap taken of R. H. Ballard and friends, in Albuquerque, New Mexico. This was during Mr. Ballard's recent recruiting tour for convention delegates. Undoubtedly individuals of this high calibre of intellectuality will prove of great helpfulness at the big convention. The gentleman to the left is Mr. I. F. Greenawalt of the Pacific States Telephone & Telegraph Company, Denver, Colorado. The names of the two ladies have not as yet been secured.

There is plenty of cold water in the spring—do not forget that the big Pasadena conventions are also in the spring —

PASADENA — MAY 17-21, 1920

Napoleon met his match at Waterloo—you will meet just the men you want to see at the Pasadena conventions —

PASADENA — MAY 17-21, 1920



## HAPPENINGS IN THE INDUSTRY

### POWER SHORTAGE AGREEMENT

Seventeen of the leading power companies of California have agreed to stand together in the present power shortage emergency. They have requested the State Railroad Commission to assume complete control in determining rules of service for the distribution of electrical energy. The signing of the following agreement was typical of the spirit of co-operation which is being maintained at this time:

"We, the undersigned, hereby pledge that we will obey and carry into effect to the limit of our ability all rules, regulations and orders of the Railroad Commission concerning diminution of service or taking on of new business and interchange or delivery of power between the several companies." Signed by:

California Oregon Power Company, Pacific Gas & Electric Company, Great Western Power Company of California, Western States Gas & Electric Company, Vallejo Electric Light & Power Company, Snow Mountain Water & Power Company, Coast Counties Gas & Electric Company, Coast Valleys Gas & Electric Company, San Joaquin Light & Power Corporation, Midland Counties Public Service Corporation, Southern California Edison Company, Santa Barbara Electric Company, Mt. Whitney Power & Electric Company, Southern Sierras Power Company, City of Los Angeles, Los Angeles Gas & Electric Corporation, Holton Power Company.

### DEMAND FOR PROFESSIONAL ENGINEERS

The American Association of Engineers reports a great demand for professional engineers in all industrial centers. The supply of engineers has been reduced materially by the number going into more lucrative lines of business. Salaries for engineers are beginning to increase. Detailers on structural design work receive from two hundred to two hundred and fifty dollars per month, while transitmen are securing one hundred and seventy-five dollars per month.

### ELECTRICITY IN WALNUT GROWERS' FACTORY

The California Walnut Growers' Association have acquired a valuable site at Seventh and Mill Streets, Los Angeles, where they will erect a seven-story warehouse and factory for the handling of their annual crop of 12,000 cars of nuts. The walnut men are generous users of electricity and this new factory will have several unique applications, including the use of electric mangles to kill coddling moths which breed in the empty sacks. Another application will be the new machine for branding walnuts. This machine was designed in response to an advertisement offering \$10,000 in prize money to anyone who could develop an automatic device for this delicate work.

### DISTRICT OFFICE AT DELANO

On account of the rapid development in the southern portion of Tulare county as well as the northern part of Kern county, the Mt. Whitney Power and Electric Company has found it necessary to establish a new district office at Delano. The new territory will embrace the towns of Pixley, Sarlimar, Richgrove and McFarland, and the city of Delano.

This district is now an important part of the Edison system as the new Vestal substation, located at Richgrove, will be the point of connection between the Big Creek lines, the new Kern River Number Three plant and the new 60,000-volt loop connecting the Mt. Whitney stations.

The company has a two-story, reinforced concrete building at Delano. This was designed as a substation but when the system was changed to 60,000 volts an outdoor type installation was made, leaving the building available for a commercial office.

Rodney E. Bacon will be district agent and Richard L. Wells will be district foreman in the new territory, which will be completely organized by April first.

### RE-ADJUSTMENT OF CHARGES

The Southern California Edison Company has filed an application with the Railroad Commission asking for a complete re-adjustment of its charges for electrical energy in the counties of Los Angeles, San Bernardino, Riverside, Orange, Ventura, Kern, Tulare and Fresno. The company claims that its present charges, including a surcharge allowed by the Commission in December, 1918, do not, because of greatly increased operating expenses, yield a fair return on the company's investment of approximately \$84,873,000. As a further reason for an increase in its rate the company says that the scarcity of water will greatly increase the company's outlay for fuel oil for its steam plants. In 1920 the company estimates its outlay for fuel oil, largely because of the shortage of water power, will be \$1,750,000 in excess of its oil expenditures for 1919.

### DAM ACROSS SNAKE RIVER

A tentative contract between the United States and the canal companies and irrigation districts interested in the storage and utilization of the flood and normal flow of the Snake river in Idaho has been approved by Secretary Lane. Plans now being worked out provide for the construction of numerous storage dams. At American Falls it is proposed to construct a high dam across Snake river, creating one of the largest irrigation reservoirs in the United States. The construction of this dam will necessitate the removal of the town of American Falls to a tract of level table land near by, and the removal of the line of the Oregon Short Line railway to higher ground. Construction of the American Falls reservoir, capacity 3,000,000 acre-feet, may be undertaken almost immediately by the United States Government under a contract with Idaho canal companies and irrigation districts. The Department of the Interior has already signed a tentative contract whereby the federal government will assume the work of construction, while Idaho water users will pay the expense of the undertaking. The proposed Twin Falls-Bruneau reclamation project, a dam 90 feet high, 5,280 feet long at the top and 500 feet long at the bottom is planned.

### SOCIETY INCREASES ACTIVITY

During the war, the Society for Electrical Development was obliged to restrict its activities, although it continued throughout to do all its curtailed budget permitted, and carried on sufficiently to justify the subscriptions of those members who supported it. During the past three months so many of the big companies have resumed their membership that the funds available for the society's work are over fifty per cent greater than at the time of the November meeting of the board of directors.

Greater activities will be undertaken as justified by the increased revenue, and it is now desired to line up the entire industry in support of the very important work being carried on and contemplated. This work has for its main feature the education of the public to an appreciation of the uses of electricity for domestic and power purposes.

### PERMANENT RATE INCREASE APPLIED FOR

An application has been filed by the San Diego Consolidated Gas and Electric Company with the Railroad Commission, in which the company asks that the temporary surcharge granted them last April be made permanent. The company states that all the signs point towards an increase in operating expenses instead of a decrease and that the



federal income taxes which the Commission refused to allow as operating expenses will be a permanent charge.

The present surcharge was to have continued in effect until May 1, 1920, and if the claim of the company regarding the permanency of the federal income tax is allowed all of the other companies will be able to include it in their operating expenses, which will make a material difference in the earnings of the companies.

### RECLAMATION PROJECT

The Oregon State Engineer has approved the general plans for the reclamation of the lands in the Grants Pass Irrigation district, which comprise an area of about 8,000 acres of land lying adjacent to the city of Grants Pass, in Oregon. It is proposed to expend \$106,000 in the installation of a temporary pumping plant to deliver water to the cultivated area within the district during 1920, and the construction of laterals and other structures for the delivery of water to the district lands. A considerable part of this construction work will be utilized in connection with the construction of a permanent system under which it is intended to construct a diversion dam in Rogue river and canals which will serve most of the lands within the district. However, the higher lands in the district will be served by direct connected pumps. It is estimated that the complete reclamation of the project will cost in excess of \$500,000.

### SPECIAL LIBRARY CENSUS

At a time when the government is counting up its inhabitants, the Special Libraries Association is enumerating the special library collections of the country, because there does not exist at present an adequate directory of special libraries.

In the spirit of cooperation, and in order to list the special information sources of the country, the Special Libraries Association—the national body of special librarians—submits the following questions and is asking business men to answer them. When compiled, the directory will not be used as a mailing list for advertisers, but merely for the purpose stated,—to have in a central place, a record of the special information sources of the country.

A special library has been defined as, "A good working collection of information either upon a specific subject or field of activity; it may consist of general or even limited material serving the interests of a special clientele; and preferably in charge of a specialist trained in the use and application of the particular material."

The Special Libraries Association asks for the following information from libraries which come within the above qualifications:

- (1) Name of institution or company.
- (2) Name by which library is known.
- (3) Name of librarian or custodian.
- (4) Can it be classified as any of the following: financial; business; legal; engineering or technical; institutional; municipal; reference; agricultural.
- (5) If not, how can it be classified?
- (6) Does it serve a special clientele?
- (7) Would your librarian be willing to assist other special libraries to a reasonable extent?

The above data should be sent to Wm. F. Jacob, Chairman Library Census Committee, care General Electric Company, Schenectady, N. Y., who will be glad to answer any questions relating thereto.

### SEATTLE STREET CAR TRAFFIC

Rapid growth of traffic on Seattle's street railway system necessitating additional car service on downtown trunk lines already congested during peak load periods, has brought about a situation which has reached an acute stage, according to Superintendent of Utilities Thomas F. Murphine. Statistics which he has compiled for incorporation in his annual report show that the municipal street railway lines have carried 92,061,302 passengers during the eight months since the city took over the traction properties. In the similar eight months of last year, the lines carried 79,959,132 passengers, 12,102,170 fewer than this year.

In order to take care of the increased amount of traffic, at least 50 additional cars are needed, but these cars could not be successfully operated on First, Second and Third Avenues without increasing traffic congestion, already serious. According to Superintendent Murphine, the situation emphasizes the need of a subway and elevated system in the business district.

### EMERGENCY WATER CONSERVATION CONFERENCE

The Emergency Water Conservation Conference, headed by E. O. Edgerton, president of the California Railroad Commission, and formed of state and federal officials whose duties keep them in touch with the water situation, have met in San Francisco to make recommendations that will secure the greatest efficiency from the available water and power and reduce to a minimum the damage resulting from the shortage of water. The first recommendation made by the conference was that all irrigating be done in the night time, as then the greatest good is done by the water and there is no loss on account of evaporation. The night irrigating will also remove the peak from the power companies' load.

The personnel of the Conference is as follows:

E. O. Edgerton, president Railroad Commission; C. T. Harding, for the State Engineer; Frank Adams and F. J. Veihmeyer, U. S. Dept. of Agriculture and U. of C. Irrigation Investigators; G. H. Hecke, State Dept. of Agriculture; C. H. Lee, State Water Commission; H. D. McGlashan, U. S. Geologic Survey; A. H. Palmer, U. S. Dept. of Agriculture; H. G. Butler, State Power Administrator; Lt.-Col. L. H. Rand, U. S. Dept. Interior Waterways; C. H. Loveland and L. S. Ready, Railroad Commission of California.

### POWER PLANT TO APPLY POWDERED COAL

The Philadelphia Rapid Transit Company, after careful investigation, has decided to equip its Mount Vernon street power station with a powdered coal system for firing the boilers, using river and buckwheat anthracite coal. This plant is at present producing 75,000 kw-hr.

Considerable economies are to be realized through greater combustion efficiency, saving in labor, and ability to use a much lower grade fuel than that now in use. The powdered coal equipment which is to be installed will be the Quigley system which includes complete apparatus for preparing, distributing and burning the fuel. This system will permit accurate records of fuel consumption for each individual boiler. The change from hand fired to powdered coal will be made without interruption to service.



The San Joaquin Light and Power Corporation have been giving remarkably fine publicity to their stock campaign. The company is offering \$3,500,000 in 7% cumulative prior preferred non-assessable stock at \$98.50 per share. Above are shown three full-page newspaper advertisements which were instrumental in convincing prospective stockholders to invest in public utility stock.

The wets have almost given up hope for John Barleycorn—there will be little hope for you if you fail to attend convention —

PASADENA — MAY 17-21, 1920



## THE WATER POWER LEAGUE OF AMERICA

### A Letter to the Editor

(Inquiry having come into the editorial department as to the present status of The Water Power League of America, the following letter from the president of the McGraw-Hill Company, publishers of eleven national engineering magazines, should prove interesting and helpful.—The Editor.)

Sir:

As I understand it, the Water Power League of America was organized to do for Industry generally and for the public at large what N. E. L. A. is doing for the electrical industry. I understand the League is governed in general by the same principles which actuate the N. E. L. A. and is working for the same purpose. If it is a duplication, and if the League cannot extend its activities to educate the public in a conservative way, naturally I would have no use for it and could not continue as a member of the League or as a member of the Advisory Council. Personally, I have not been in close touch with it. Some of the leading members of the Advisory Council are: Gen. Geo. W. Goethals; Dr. Edward G. Acheson, past president of the American Electro-chemical Society and now connected with the Niagara Falls Power Company; John G. Luke, president of the West Virginia Pulp & Paper Company; Emerson McMillin; A. H. Smith, president of the New York Central Lines; Paul Starrett, president of Geo. A. Fuller Company.

The League is entirely new. Whether or not it can justify its existence I do not know. You may, however, rest assured that neither Electrical World nor any of the McGraw-Hill publications nor I will back any program that is not helpful to the electrical industry. If you have any other point of view, or if you get any information bearing on the situation, I shall appreciate it if you will acquaint me with the facts as you see them.

At the beginning, Mr. Chas. H. Ingersoll, of Dollar Watch fame, was a member of the League and was proposed as a member of the Advisory Council. It soon developed, however, that his views were not in accord with the majority. As I understand it, his ideas were more or less in accord with those of Gifford Pinchot and when he discovered that the Council was in favor of the present water power bill before Congress he resigned from the League and as a member of the committee.

Very sincerely yours,

JAS. H. MCGRAW.

## LIGHTING OF BROADWAY, LOS ANGELES

### A Letter to the Editor

I note that in an editorial in the February 15th issue of the Journal of Electricity, you refer to the lighting standards being placed too high in Los Angeles. Most of this criticism originated prior to the time the lights were turned on, just the same as it did in San Francisco, and was largely due to the customary inability of the layman to accommodate himself to radical changes. Furthermore, he knows nothing about characteristics of light distribution. The principal reasons for placing the lights high are:

- 1st: The high power source is more out of the direct line of vision.
- 2nd: The general distribution is much better, and the effect of high intrinsic brilliancy minimized.
- 3rd: The reflections of the lamps in the show windows are projected at a lower angle and come less into the line of vision and therefore interfere with the window displays.
- 4th: Horizontal shadows of street cars and other objects are shortened.
- 5th: The high standards look much more dignified by day as well as by night, and, owing to the height of the mass, the sidewalks look less narrow than with the ordinary low standards with their clusters of globes ten or twelve feet above the sidewalk.
- 6th: In intensive white way lighting it is desired to carry the light up to the sky-lines of the buildings with good illumination on the cornices, so that for this reason if no other the lamps should be placed 25 to 30 feet above the sidewalk level.

Modern intensive white way lighting should be regarded in a measure as floodlighting with the decorative features of

the lighting units themselves maintained. The layman who is accustomed to the ordinary low lighting standards and suddenly is confronted with the high standards would feel the same as he would in putting on a silk hat for the first time after wearing a derby squashed down on his ears. He would sub-consciously know that he looked more dignified but it would take a little while for him to become accustomed to the change, after which he would dislike to go back to the derby.

W. D'A. RYAN,

Director Illuminating Engineering Laboratory.

### An Apology

In the February 15th issue of the Journal of Electricity the article on the Broadway Lighting System of Los Angeles was credited to W. D'Arcy Ryan, instead of to A. F. Dickerson. The greater part of the data was supplied by Mr. Ryan, but Mr. Dickerson was the author of the article as published. We tender our apologies to both for the error.

## TRADE NOTES

### Change in Construction Department —

The electrical construction department of the Pacific Fire Extinguisher Company has been discontinued. The former manager of this department, Mr. H. C. Ried, will continue the electrical construction business under his own name, with temporary headquarters at 440 Howard street.

### Prizes for Window Display and Sales Story —

Several months ago the Benjamin Electric Manufacturing Company inaugurated a window trim and sales story contest among its distributors and dealers, the objective being the sale of a million Benjamin Two-Way Plugs, the No. 92 Cluster, during the holiday season.

There were three prizes: first, \$100; second, \$75; third, \$50, for the best window display on the Two-Way Plug, and similar prizes for the best sales story about the Benjamin Two-Way Plug.

In response to an offer to supply gratuitously complete equipment for window trimming and the facilitating of sales, nearly 1,000 direct returns were received. The dealers went into the thing enthusiastically and a mass of photographs of trimmed windows and sales stores was submitted to the judges.

### Branch Plant to be Constructed —

The Apex Appliance Company of Chicago is planning the construction of a branch plant at Oakland, California, to have an initial capacity of 20,000 electric washing machines annually. This company also manufactures vacuum cleaners, ironing machines and similar appliances.

### Use of Preferred Stock Money —

The Western States Gas and Electric Company, which operates in Stockton, has been authorized to use \$56,191.80 obtained from the sale of preferred stock. The money will be applied towards the payment of current indebtedness resulting from the construction of extensions, additions and betterments to the company's plant.

### Wire Company Purchased —

The American Chain Company of Bridgeport, Connecticut, has purchased the control of the Page Steel & Wire Company, with mills at Moneason, Pennsylvania, and Odrian, Michigan. It is the intention of the American Chain Company to continue the business of the Page Steel & Wire Company as heretofore, taking only its surplus product. The plants consist of open hearth furnaces, rolling mill, wire mills, as well as fence factories.

**Erratum:** In the article descriptive of the Fontana plant in the March 1st issue of the Journal of Electricity, the words "deflecting nozzles" should read "jet deflectors."



## LATEST IN EVERYTHING ELECTRICAL

(The new regulator presented here combines the qualities of simplicity and strength so desirable in this sort of a machine. The control valve is of the balanced piston type and has a cap which can be unbolted and removed without removing the valve body from the pipe line. An account of the latest use of electricity in the clothing establishment is also given.—The Editor.)

### NEW COPEs REGULATOR

In 1912, the Northern Equipment Company, Erie, Pa., brought out and patented the continuous feed principle of boiler feed control. They showed that water should be fed proportionately to and variably with the load. This gives a variable water level temporarily inversely proportional to the load; it gives a temporarily decreased feed on sudden increase in load, and a temporarily increased feed on sudden decrease in load.

Up to the year 1912 all feeding was intermittent in character and an absolutely constant water level was considered ideal. Now, however, opinion is unanimous with regard to correct feeding and authorities agree that the so-called "Copes Method" is correct in principle.

Since the introduction of this mechanical regulator changes have been made from time to time in the details of construction, the principle of feeding in the meantime remaining the same.

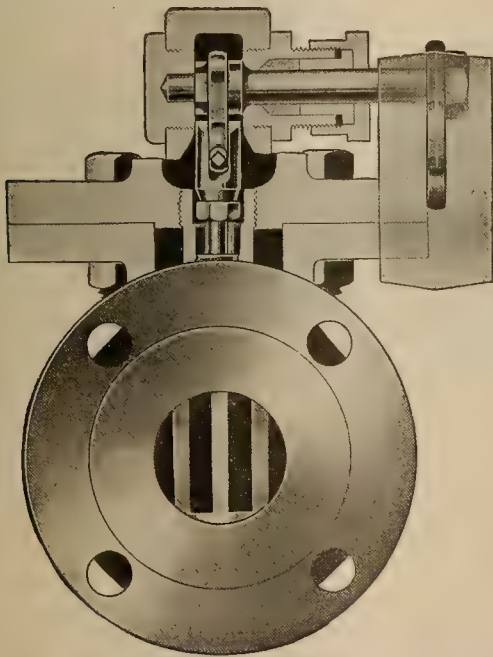


Fig. 1. Vertical section through the valve, displaying the horizontal shaft, the stuffing box, and the link work connecting the shaft with the piston valve.

In the new Copes control valve the reciprocating stuffing boxes have been abandoned, and in their place we have a horizontal shaft which rotates very slightly, performing the same function as the old reciprocating rod. Naturally, this new design is very sensitive. The frictional resistance has been reduced as much as 6 to 16 pounds. It is now practically zero because the shaft rotates very slightly and the same part of the shaft is always in the stuffing box.

The valve is of the balanced piston type. The weight on the valve lever exerts a constant closing force of 50 pounds on the valve piston at all times. A weight is used here rather than a spring because gravity does not vary whereas springs grow weak with age, corrode, stick, break, etc.

Another novel feature is shown in Fig. 2. The valve cap or bonnet can be unbolted and removed with fittings attached as photographed without removing the valve body

from the pipe line. Any engineer will appreciate the great advantage inherent in this feature.

Valve fittings can be easily removed and renewed. A monkey wrench or any other kind of a wrench and a piece of flat stock are the only tools required.

The assembled regulator complete consists principally of a heavy expansion tube—the long diagonal tube plainly visible in the illustration. This is known as the "thermostat." It is a straight piece of heavy metallic tubing  $1\frac{1}{2}$  in. in outside diameter. There is nothing about it to wear out. The top of the thermostat is connected with the steam space of the boiler and the bottom with the water space. Hence there is a water level in the thermostat corresponding with the water level in the boiler. It is this water level in the thermostat that determines the rate of feed. The tube lengthens and shortens with drop and rise of water level. The lengthening and shortening are caused by change in temperature of the tube as the water rises and falls. This expansion or contraction is amplified by means of the link work, and through the link work operates the control valves. All parts are simple, strong, heavy and rugged.



Fig. 2. The valve cap or bonnet can be unbolted and removed with fittings attached, without removing the valve body from the pipe line.

### NEW APPLICATION OF THEATER LIGHTING EFFECTS

The artistic lighting effects produced in theaters by regulating the intensity of the various colored lights has been adopted by a New York clothing establishment to aid in the display and sale of feminine apparel.

By means of six electric push buttons set flush into the wall of the display room, the salesman can regulate the lighting for any desired color or intensity. This automatic control from push buttons is accomplished by using three lighting circuits, the lights of each circuit representing one of the three primary colors. It is evident that any color in the solar spectrum can be produced by the proper blending of these three colors. The brightening and dimming of each color is produced by three Cutler-Hammer dimmer plates, operated independently by an electric motor, one plate being provided in each of the three color circuits.

Placed under each dimmer plate are a pair of electromagnets, the coil of each magnet being connected to one of the push buttons. An armature, which normally hangs free between the magnets of each pair, moves forward or back-

The man whose creditor stands behind him looks forward—the entire West is looking forward to the spring conventions—

PASADENA — MAY 17-21, 1920

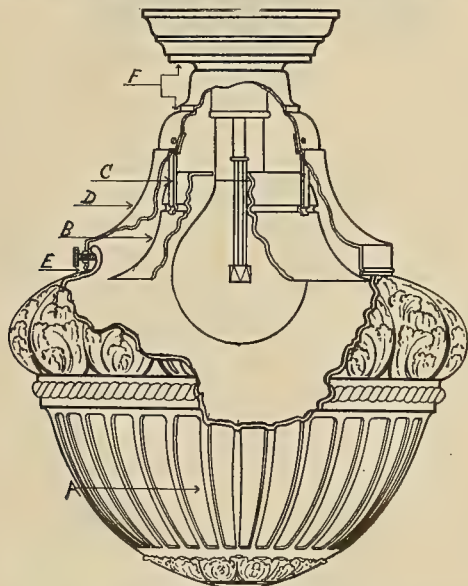


ward when attracted by either magnet. This movement of the armature closes a switch and starts a small motor, which is geared to a driving shaft running the length of the dimmer bank. The attraction of the armature to one of the magnets also causes a rack to engage with a pinion on the driving shaft, thereby transmitting the rotating motion of the shaft to the dimmer arm, and brightening the lamps of that color circuit. The energizing of the other magnet by depressing the other push button attracts the armature in the other direction and engages the shaft pinion with a rack parallel to the first, and which revolves the dimmer arm in the other direction, thereby cutting in resistance and dimming the lamps. The lamps of any circuit increase or decrease in brightness only while the "bright" or "dim" button of that circuit is depressed. Upon releasing the button the light remains stationary. Two magnets, an armature, two parallel racks and a pinion on the driving shaft are provided for each dimmer plate. The rate of dimming allows about twenty seconds to dim the lamps of any color from full "on" to "out."

The importance of showing a garment with the proper color setting is fully recognized by clothing salesmen, the color desired depending on the color and character of the goods of which the gown or suit is composed. This dimmer bank is proving itself a valuable addition to the sales force, and at the same time does not increase the duties of the salesman, who has the complete control of color at his finger tips.

#### A NEW LIGHTING UNIT

The "Supreme" Reflectolyte, manufactured by the St. Louis Reflectolyte Company, has a number of new and valuable features, illustrated in the sectional drawing below: the translucent blown glass urn (A), of surface ornamentation in Classic and Gothic periods; the bell-shaped metal holder or body (D) supports the urn and completes its graceful outline; the concealed steel reflector (B), with its white porcelain-enameled reflecting surface fused on at a temperature which melts glass, utilizes the horizontal and upwardly inclined rays, redirecting them outwardly and downwardly; the



The new and valuable features of the "Supreme" Reflectolyte are clearly shown in this cross-section drawing.

spring fingers (C) support the porcelain-enameled reflector in a fixed position with relation to the lamp filament and the bowl, and permit instant removal and replacement.

A very interesting feature is the system of ventilation. The cool air enters at the junction (E) of the urn and the metal holder, rises between the body (D) and the non-reflecting surface of the reflector (B) and passes out at "F." Thus it will be seen that any dust or dirt entering the reflectolyte will not be deposited either on the inner surface of the urn,

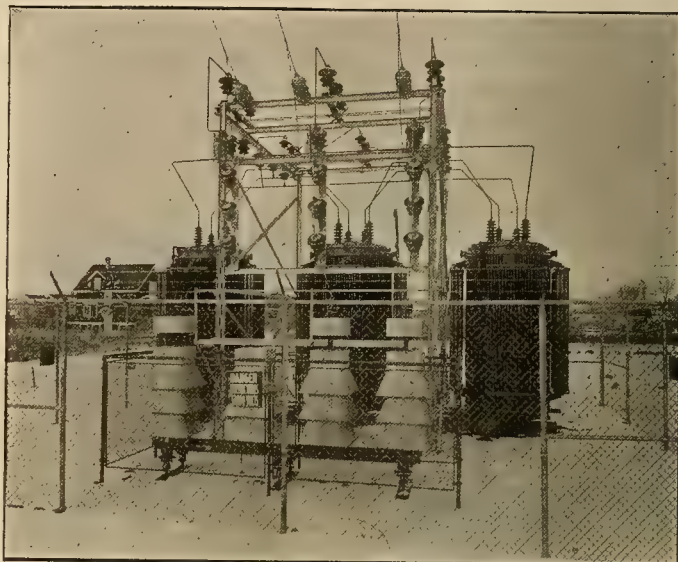
on the reflecting surface of the reflector, or on the lamp itself. At the same time ample ventilation is provided.

Another interesting feature is the position of the filament of the lamp, which is not in the center of the urn, as is usually the case, but is positioned high up on a horizontal plane with the lower edge of the reflector and the upper portion of the urn. This unusual arrangement accounts for this lighting unit's superior efficiency, as well as its beautiful appearance when lighted.

#### UNIT TYPE OUT-DOOR SUBSTATIONS

A new form of unit type standard substation for capacities up to 5000 kva. and 33,000 volts is being manufactured by the Delta-Star Electric Company, Chicago, Illinois. The expanded steel sections are so arranged that the center transformer can easily be removed if necessary.

The three pole air break switches, choke coils, fuse mountings and bus-bar supports are all of the unit type form, and easily clamped to the galvanized steel framework. The switches are operated from ground level and can be securely locked in either open or closed position.



Unit type substation especially designed for outdoor installation

Space is provided and provision made for the installation of oxide film arresters, connection being made to the lower insulators of the combined disconnecting switches and fuses.

The sectional or unit type assembly is well adapted for large outdoor substations and a 35,000-kw. station is now being built. The advantage of unit type parts which can be quickly assembled in the field is obvious.

#### NEW MAGNETICALLY OPERATED SWITCH

Magnetically operated main line switches on alternating current light and power circuits are at times slow and unreliable in closing when a solenoid and plunger must be depended upon for their operation. If the plunger is slightly out of adjustment, its movement becomes jerky and noisy, its sealing pull is diminished, and it does not seat properly.

The Cutler-Hammer Manufacturing Company of Milwaukee, Wis., has developed a new oil-immersed magnetic contactor, operated by a clapper type magnet, which makes possible a more rigid mechanical structure and greater reliability in operation than is obtained in contactors of the solenoid and plunger type. This contactor has a capacity of 100 amperes at 2200 volts, and is particularly desirable as a main line switch for an automatic 2200-volt motor starter, or for the remote control of any 2200-volt light or power circuit. It is built with three poles, unless used with an auto-transformer starter, when five poles are provided.



## Book and Bulletins

### Industrial Lighting

The Benjamin Electric Manufacturing Company has published a book on Industrial Lighting that embodies much practical information for applying the principles laid down by illuminating engineers as the best practice in the lighting of buildings and areas devoted to industrial uses.

The book has been prepared to be helpful to anyone whose objective is the attainment of correct industrial lighting. There has been a general movement in this field to raise standards of production, reduce accidents and spoilage, and to make the task of the worker more acceptable through the application of higher lighting intensities.

The considerations governing the selection of lamps and reflectors are explained in simple terms. There is a chapter on general illuminating information, with tables and definitions which reduce to simple terms the complex formulæ out of which correct deductions with regard to the specification of lamps and fixtures are resolved. There is a table giving the foot candle intensities desirable as worked out from a consensus of the best opinions of illuminating engineers and physicists, and a complete presentation of the electrical symbols used on architects' drawings.

A feature of unusual interest is the charts of industrial fixtures which present a study of reflector contour, light distribution diagram and lamp so that the specification for any particular use is easily arrived at without recourse to any data other than that given in this book.

Numerous examples of industrial lighting requirements, with actual photographic reproductions of results, add greatly to the usefulness of this very practical book on industrial lighting.

The George Cutler Company is issuing a bulletin which illustrates and lists the new line of series and multiple street-hoods which they are introducing. These street-hoods are radical departures in design from previous styles.

### Bureau of Standards

Recent scientific papers published by the Bureau of Standards are as follows:

No. 343: "Location of Flaws in Rifle-Barrel Steel by Magnetic Analysis," by R. L. Sanford and William B. Kouwenhoven.

No. 349: "Photoelectric Spectrophotometry by the Mill method," by K. S. Gibson.

No. 351: "Dependence of the Input Impedance of a Three-Electrode Vacuum Tube Upon the Load in the Plate Circuit," by John M. Miller. Because of the capacities between the electrodes of a three-electrode vacuum tube, the input impedance, which determines the input voltage supplied to the grid of the tube by the apparatus in the input circuit, depends upon the electrical characteristics of the plate or output circuit. In this paper theoretical relations are established which permit the input impedance to be calculated when the impedance in the plate circuit is known.

### Electric Cranes

Two interesting booklets on electric cranes have recently been sent out by the Toledo Bridge & Crane Company of Toledo, Ohio. Of these Bulletin 21 presents a long list of users of the Toledo cranes, together with letters and photographs descriptive of the service they are rendering.

### Railway Substation Economies

Under the above title the General Electric Company of Schenectady publishes an attractive illustrated booklet de-

scribing automatic substation apparatus and its advantages. The booklet consists mainly of excellent photographs of automatic substations in many different parts of the country.

### Opportunities for Technical Graduates

Westinghouse opportunities for technical graduates are very thoroughly explained in an illustrated pamphlet bearing that title, recently issued by the Westinghouse Electric & Manufacturing Company.

This booklet describes, in considerable detail, the plan which has been developed by this company for the training of the graduates of technical schools at all of its various works. In the booklet is included a list of prominent Westinghouse men who originally entered the company as graduate students, as well as a complete list of schools from which over 5,000 students have entered the employ of the company.

Copies of the booklet will be sent to anyone interested on application to the educational department of the company at East Pittsburgh.

### University Publications

The recently organized Engineering Experiment Station of Purdue University, Lafayette, Indiana, has published a bulletin entitled "Electric Ranges," which presents the characteristics of the different types of electric ranges as well as data on the cost of baking with electricity.

The University of Illinois Engineering Experiment Station is publishing a series of bulletins on warm-air furnace research. The first of this series, Bulletin No. 112, is entitled "Report of Progress in Warm-Air Furnace Research."

Bulletin No. 316, from the University of California Agricultural Experiment Station, is I. J. Condit's "The Kaki or Oriental Persimmon." Bulletin No. 317 is H. I. Webber's "Selection of Stocks in Citrus Propagation." Circular No. 216 is an account by T. D. Batchelor and H. S. Reed, of studies made through several seasons on the so-called Persian walnut. Stanley S. Rogers presents an interesting report: "Methods for Marketing Vegetables in California," in Circular No. 217.

### Miscellaneous

A large size booklet recently sent out by the General Gas Light Company of Kalamazoo, Mich., illustrates the newspaper cuts which the company has available for advertising the Humphrey Radiantfire. A large colored advertising card has also been sent out.

A booklet describing the Nordstrom Lubricated Plug Valve has been issued by the Merrill Company of San Francisco.

"Beldenmold" is the title of a small but informative bulletin on synthetic molded insulation, prepared by the Belden Manufacturing Company of Chicago.

A recent Westinghouse booklet of distinct value and interest deals with the Westinghouse underfeed stoker. It is very fully illustrated.

"Fuel Oil and Its Use," is the title of a Tate-Jones Company booklet which contains pictures and illustrations of various types of oil burners.

The Diesel engine is thoroughly described and illustrated both internally and externally in a recent booklet published by the Allis-Chalmers Manufacturing Company.

Revised and enlarged Bulletin No. 112-B entitled, "Condensers, Pumps, Cooling Towers, Etc.," has just been published by the Wheeler Condenser & Engineering Company, Carteret, New Jersey. This bulletin illustrates the latest developments in condenser practice.

Postage stamps in hot weather often stick together—the West must stand together if it is to tell its story properly to Eastern visitors —

PASADENA — MAY 17-21, 1920



## NEW ELECTRICAL DEVELOPMENT

(The Northwest reports that a bid for the construction of a railway to the Skagit river plant site is being considered. Numerous applications have been filed for construction of big dams and power plants in both the Pacific Central and Southwest districts. Power companies in Idaho and Utah are applying for rate increase.—The Editor.)

### THE PACIFIC NORTHWEST

**CENTRALIA, WASH.**—Ground has been broken for the electric plant of the Sherman County Light & Power Company.

**TACOMA, WASH.**—The Tacoma Railway & Power Company has purchased six additional one-man cars from the American Car Company of St. Louis, same to be equipped throughout with Westinghouse equipment.

**SALEM, ORE.**—The construction of a power house will be started by the Enterprise Electric Company as soon as their application for appropriation of water from the Willowa river has been granted. The plant will cost about \$150,000.

**PORTLAND, ORE.**—The State Engineer has received, since the first of January, twenty-one applications to appropriate water for power developments. This totals 600,000 horsepower which is three and one-half times the amount previously developed in the state.

**KLAMATH FALLS, ORE.**—An election will be held at Merrell, April 1, on the question of creating a new irrigation district, to be called the Patterson district, and to select three directors. The county court has confirmed steps taken so far to create the new district.

**SEATTLE, WASH.**—An engineering report on a five-mile project for redeeming land in Franklin and Walla Walla counties has been filed with the state reclamation board. One hundred thousand acres of land are under consideration and 30,000 horsepower will be developed.

**CORVALLIS, ORE.**—Professor T. A. Teeter, of Irrigation and Hydraulics at Oregon Agricultural College, says that a water shortage, resulting from lack of rain last month, threatens the state. He warns users of storage water to be careful and says that irrigation managers should plan field moisture and stop every leak in the system.

**SEATTLE, WASH.**—In response to the city's calls for figures from contractors for the construction of the 22 miles of railroad from Rockport up the Skagit river to the vicinity of the Skagit power plant site, the Grant-Smith Company submitted the only bid received by the board of public works, which contained the proposal to construct the railroad for the sum of approximately \$600,000. C. F. Uhden, hydroelectric engineer in charge of the Skagit project, states that he considers this figure too high for the undertaking projected. The matter will be disposed of shortly.

### THE PACIFIC CENTRAL DISTRICT

**VALLEJO, CAL.**—It is learned that the Pacific Gas & Electric Company will erect a modern office building on the old Martin property in the 400 block on Virginia street, Vallejo. Construction is to start at an early date.

**SACRAMENTO, CAL.**—Rindge Land Reclamation District has sold \$1,201,500 5½s to the Rindge Land Navigation Company at par. The Contra Costa County Bank has bought \$50,000 of a block of \$440,000 5s, City of Pittsburgh Municipal Improvement.

**TULARE, CAL.**—The problem of an auxiliary pumping plant for the west side was brought up here recently by the representative of a pump company. The trustees decided that as soon as possible bids would be called for the putting down of a well and the installation of pumps.

**SACRAMENTO, CAL.**—The state reclamation board approved plans of District 2021 in San Joaquin county for completing its work in the Merced Island district. New drainage canals and pumping facilities will cost upward of \$300,000.

**FRESNO, CAL.**—The State Engineer has written to the board of supervisors requesting full information on the project for the formation of the Fresno irrigation district, which came before the board through a petition on March 1.

**PARADISE, CAL.**—The Paradise district is assured an up-to-date telephone system as a result of forty families signing up for the proposed service. The committee in charge announces that the new system should be in operation within ninety days.

**MARYSVILLE, CAL.**—At an election of land-owners held here the Glenn-Colusa Irrigation District was organized. The district embraces 103,000 acres of land on the west side of the Sacramento Valley in Glenn and Colusa counties. An election to decide upon bonds will soon be called, the secretary stated.

**SAN FRANCISCO, CAL.**—Out of 803 applications to the California Railroad Commission only 57 concerned electric companies. Of 168 applications to increase rates, 21 were filed by electric companies. During the year the Commission rendered 943 decisions, the second largest number in its history.

**LOS BANOS, CAL.**—The San Joaquin and Kings River Canal and Irrigation Company (Miller & Lux) has mailed out circular letters to its patrons attacking the proposed formation of the West San Joaquin Irrigation District, and threatening to raise its water rates if the district is formed.

**ALTURAS, CAL.**—An election has been called by the board of directors of the Hot Spring Valley Irrigation District of Modoc county, recently organized in this county, to determine whether the district will issue \$100,000 worth of bonds. The money is desired to construct necessary reservoirs, canals, etc., for irrigating the country embraced in that district.

**SACRAMENTO, CAL.**—Application of the Crooks Irrigation District in Modoc county for approval of its plans to bond the district in the amount of \$80,000 for improvements, has been approved by the State Irrigation District Bond Company. The district was organized in 1919, and comprises approximately 6000 acres of land.

**SAN FRANCISCO, CAL.**—A supplemental order issued by the Railroad Commission amends the lease under which the Pacific Gas & Electric Company took over the properties of the Sierra and San Francisco Power Company to the extent that it fixes March 31, 1920, as the time limit of the time allowed for fixing upon the values of certain of the properties involved.

**SAN RAFAEL, CAL.**—Mayor George F. Rodden signed a deed conveying to the United States Government the right-of-way for widening and deepening the San Rafael canal, leading from San Rafael to San Francisco Bay. San Rafael's special tax of \$14,800, a part of the fund of \$54,600 to be expended on the improvement, was made available for the use of the Government engineers under whose supervision the work will be done. The federal appropriation for the work was \$27,300 and the state supplied \$12,500.

**REDDING, CAL.**—The Happy Valley Irrigation District will sell \$100,000 worth of bonds at its office in Olinda on March 15, to raise money

to complete the construction of the Messelbeck dam, to finish digging the Hoover tunnel and for enlarging and extending its canals. The bonds bear 6 per cent interest and run from date over varying periods to 1939 and 1958. The district was bonded originally for \$65,000. The coming sale will be made from bonds held in the treasury.

**SACRAMENTO, CAL.**—Declaring the Iron Canyon Project is the salvation of the Sacramento Valley, and the means by which water can be stored properly for use in the summer months, Commissioner D. W. Carmichael urged the city commission to take a stand for this project, and "start a fight, if necessary, against the arbitrary and dictatorial policy of power companies."

**AUBURN, CAL.**—A 150,000 mortgage has been filed in the office of the county recorder, whereby the North Fork Ditch Company, operating in Placer and Sacramento counties, gives a mortgage to the C. W. Clark Company. The time is three years and the rate of interest 6 per cent. The North Fork Ditch Company claims 3000 inches of water from the North Fork of the Sacramento river and 20,000 inches from the North Fork of the North Fork.

**SACRAMENTO, CAL.**—Bonds in the amount of \$4,952,986.76, issued as a lien against lands in Reclamation District No. 1500, in the Sutter Basin, were on sale at the Yuba City, Sutter county courthouse on Saturday, March 13. The bonds bear 6 per cent interest and are to be paid in twenty years. The amount to be produced by the sale of the bonds already has been expended in construction work in the district.

**MARTINEZ, CAL.**—Boring a well in the hope that he would find a supply of water for farm use, Michael Cavich, a farmer near here, uncovered a water gusher of a daily capacity of 72,000 gallons. An investigation is to be made by the town trustees for the purpose of determining the availability of this water supply for town purposes.

**LAKEPORT, CAL.**—The Snow Mountain Water & Power Company has been authorized by the Railroad Commission to issue stock to the extent of \$1,500,000, for the purpose of acquiring funds with which to build a dam at the Gravelly Dam site and to improve its power house and service, thereby increasing its service in Lake county by approximately 25 per cent.

**SAN RAFAEL, CAL.**—Officials of Vallejo, Mare Island and Benicia inspected the properties of the Marin Municipal Water District recently accompanied by representatives of the California Hawaiian Sugar Refinery at Crockett. The latter company has contracted to take 500,000,000 gallons of water annually from the water district. The raising of the height of the Alpine dam seventy-five feet and a pipe line around San Pablo Bay are planned.

**RICHMOND, CAL.**—City Attorney Frank Cornish of Berkeley and City Attorney D. J. Hall of this city will have a conference and decide on what is to go into the call for the election May 4th for the organization of a public utility district by the two cities. It is planned by the two cities, if the district is formed, to secure its water from the Marin municipal water district. A pipe line is to be laid across the bay from Point San Quentin.

**PETALUMA, CAL.**—W. Chester has received the deed of the Sonoma Valley Water, Light and Power Company's plant, also the real es-



tate and large holdings in Sonoma Valley from George L. Payne of San Francisco. With the assistance of a number of San Francisco promoters, Chester is planning to greatly improve the plant. The Lewis system will be augmented by the addition of the water rights on the O'Brien ranch in the hills above El Verano, where the water will be caught in the winter and impounded, and the Lennox Creek supply utilized.

**CRESCENT CITY, CAL.**—Del Norte county is to be opened to settlement and industry by the erection of a breakwater at Crescent City, the outpost of civilization in northwestern California. Government engineers have approved a contract for the building of a \$200,000 breakwater a third of a mile long at Crescent City, a small lumber port a short distance north of the Little Klamath river. The people of the community raised the necessary funds for the work, and are expecting Congress to make an appropriation of about \$500,000 more to continue the harbor work. When the breakwater is finished, Crescent City folk expect to make their town a great shipping point for timber, tungsten, copper and agricultural products.

**TURLOCK, CAL.**—A feature of the regular meeting of the directors of Turlock Irrigation District was their presentation of Secretary Sorenson's annual report, covering all the business transactions of the district during the year 1919. The total receipts from all sources during the year 1919 were \$453,495.21. The total disbursements during the same period were \$538,454.50. For maintenance there was expended \$90,801.61, and for general expense and the like, \$28,826.05. The sum of \$315,037.33 went for construction and the interest on bonded indebtedness cost the district \$130,289.50. The district owns and maintains 244½ miles of distributing canals, of which about 14 miles are concrete lined. Drainage canals of the district in operation at the first of the year measure up 58 miles.

**SACRAMENTO, CAL.**—In compliance with requirements of an order issued by the Railroad Commission, the Sespe Light and Power Company has filed with the Commission a description of its plans for financing the construction of electric power plants and irrigation systems on the Sespe and Piru rivers in Ventura county. The company proposes to issue \$3,000,000 of its first mortgage bonds and \$1,000,000 of its capital stock. It is estimated that the total cost of constructing the four dams, three conduits and three power plants constituting the first unit of the company's proposed development, will total over \$4,030,000. The plans of the company contemplate the wholesaling of power to the Southern California Edison Company. Wholesaling of water for irrigation purposes after it has been used for power development is also planned.

**MODESTO, CAL.**—Having carried the election for \$2,000,000 bonds by a ten to one vote, the directors of the Modesto Irrigation District will proceed now to sell the issue and join Turlock in building the Don Pedro reservoir and power plant in the upper Tuolumne river. The total cost of the enterprise will be over \$5,000,000. Turlock district has already voted favorably on the proposition. The plan is to start work on the dam by April. It will be necessary to build a ten-mile railroad to haul materials for construction either from Crouch Camp or Coopertown on the Sierra Railroad. Two years and a half will be required to complete the project. When finished, it will amplify the present water supply for the Modesto and Turlock irrigation districts and permit irrigation throughout the year. About a half million of the money will be used in extending and perfecting the drainage systems of the two districts.

**SACRAMENTO, CAL.**—Sweeping recommendations looking to the conservation of water in California were made by the various state and

federal irrigation and power agencies in the state, in an exhaustive report on the water conditions for the coming season read by Governor William D. Stephens before the Sacramento Valley Water and Irrigation Congress, which opened a three-day convention in the senate chamber at the Capitol. The report, which is in the form of a notice to all water companies, irrigation districts and water users in California, was prepared by the state and federal agencies at the request of Governor Stephens. In the report recommendation is made that farmers proposing to put new land under cultivation this year defer such action; that rice land that has become fouled or partially fouled, be rested during the present season; that irrigation companies decrease wherever possible the area irrigated; that up-to-date methods be used to retain moisture in the ground; that all wells be capped and that long-lived crops, especially orchards, should be cared for so they may not be destroyed for want of water.

**BISHOP, CAL.**—By its purchase of the Mono Power Company property the Southern Sierras Power Company acquired title to section 16, township 5, range 31, through the eastern half of which runs the gorge of Owens river. If evidence of the purchasers' intentions were needed, it is being supplied by the energetic way in which development work has begun. Fifty men are working and more are being added as fast as they are secured. A total investment of more than \$2,000,000 is contemplated by the company's plans. The largest of the series of three, or possibly four, plants will have a capacity larger than all that are now operating on Bishop creek. The first will be completed and in service this year. It will be 3300-horsepower and will be located about three-fourths of a mile up the river from the upper Mono camp. A second plant will be located not far from the foot of the grade into the canyon. The greatest work of all will be located still farther down the river. An official statement from the Riverside office is that this plant will be of capacity enough to utilize the entire normal flow of the river; that it will produce 27,000 horsepower, and that its cost will be \$2,000,000. Work has begun on the transmission line to tie the new plants into the general Southern Sierras system.

### THE PACIFIC SOUTHWEST

**PHOENIX, ARIZ.**—A contract has been signed with the Foundation Company of New York, for construction of the Gillespie dam.

**MESA, ARIZ.**—Sixteen hundred feet of the Consolidated Canal has been washed out and destroyed, in the Lehi district and on the Mesa side of the river.

**LONG BEACH, CAL.**—Plans are under way for widening and deepening the Long Beach harbor enough to accommodate the largest vessels in the Pacific.

**SEELEY, CAL.**—It is reported that directors of the irrigation district will take steps toward calling a bond election for construction of the whole or a portion of the All American Canal.

**VENTURA, CAL.**—Residents of the Conejo district have made application to the State Irrigating Board with regard to irrigation for that district. Water is greatly needed in that section.

**LOS ANGELES, CAL.**—The bid of the City Railway Company, which is a franchise-holding company for the Los Angeles Railway Company, for street railway along Broadway from Tenth to Pico streets, has been accepted by the city council.

**LOS ANGELES, CAL.**—The Southern California Edison Company has filed a supplemental order with the Railroad Commission asking authority to withdraw from a special fund created by the sales of bonds, the sum of \$630,309.34. The money is to be used to reimburse the company for capital expenditures.

**LOS ANGELES, CAL.**—The Southern California Edison Company have announced that bids have been requested for a 30,000-kilowatt horizontal steam turbine for installation in their Long Beach plant, the machine to be ready for operation by the spring of 1921. The Long Beach steam plant of the Southern California Edison Company has at present three vertical shaft turbines installed in it of capacities 12,000, 15,000 and 20,000-kva., respectively.

**GLOBE, ARIZ.**—The Inspiration Consolidated Copper Company, with offices in this city, is starting the construction for another turbo driven generator of larger capacity than any it now has in operation. If a leaching plant is built, still another generator may be installed. The Inspiration Consolidated Copper Company is one of the largest mining companies in the country, having a 12,000-kw. load; a generating plant consisting of three 6,000-kw., 6,600-volt, 25-cycle machines. The company is also connected with the Roosevelt dam hydro-stations. The turbines are largely driven by steam generated at the smelter by using the waste heat from the furnaces, in boiling at that point, and is carried by headers to the power house.

### THE INTER-MOUNTAIN DISTRICT

**PERRY, UTAH.**—The Perry Electric Light & Power Company has applied to the Public Utilities Commission for permission to increase its rates to the people of this community.

**SODA SPRINGS, IDA.**—The Utah Power & Light Company has applied to the Public Utilities Commission to enter into a franchise with Caribou county for the building of transmission lines through the county.

**PROVO, UTAH.**—The mayor of this city has been authorized to contract with the Provo Foundry & Machine Company for the abandonment of its water power site on West Center street, which will be taken over by the city.

**BRIGHAM CITY, UTAH.**—The city council of this city has decided that it cannot continue to supply electric current to the Perry Power & Light Company for resale purposes after May 1. It requires all power for the use of the municipality itself.

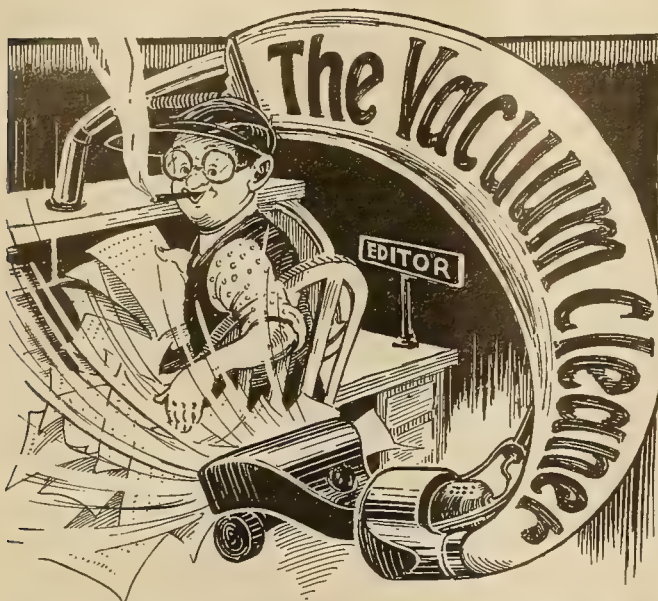
**SALT LAKE CITY, UTAH.**—The City Commission has increased its budget for street lighting for 1920 over any previous year to take care of improvements and additions. Salt Lake City is already considered one of the best lighted cities in the entire United States.

**BOISE, IDA.**—The Idaho Power Company has filed its new rates with the Utilities Commission, announcing that they are to go into effect April 1. The increase has been the subject of some discussion and the Utilities Commission has issued an order suspending the rates as proposed in the new schedule until a full investigation can be made, or for 120 days after March 31.

**BOISE, IDA.**—The city of Idaho Falls, which operates a municipal lighting plant, has protested the right of the Public Utilities Commission to fix the rates to be charged by the Utah Power & Light Company for standby service, claiming that this power rests with the municipality. The city plant was unable to furnish maximum power requirements some months ago when connection was made with the Utah Power system.

**SALT LAKE CITY, UTAH.**—Hearing on the application for an increase in power rates by the Utah Power & Light Company commenced before the Public Utilities Commission on March 4. The company claims a deficit at present ranging between two million and five million dollars, which amount will be required to enable the company to set aside an adequate depreciation fund and pay return on money invested, which amounts to approximately \$32,000,000 for property located in the state of Utah.





Selling stock to customers is the moral of a little story recently told by A. E. Wishon of the San Joaquin Light & Power Company. The company had been ordered to put a fish ladder on the Merced river, and representatives went up to present the case showing that such a course was unnecessary as the company was losing water and had very little to lose by that dam. While the hearing was in progress an old fellow came into the room, ranged himself beside the company's counsel, and proceeded to give him all the information about the history of all the salmon fishing that had ever been done in that river. As he knew more about local history than the company could have found out in a year the case was greatly strengthened and the order set aside. Afterwards counsel for the company thanked the old man for his help and asked him why he gave it.

"Well," said the man, "I'm a stockholder in your company."

"You are?"

"Yes, I own three shares of the P. G. & E. stock."

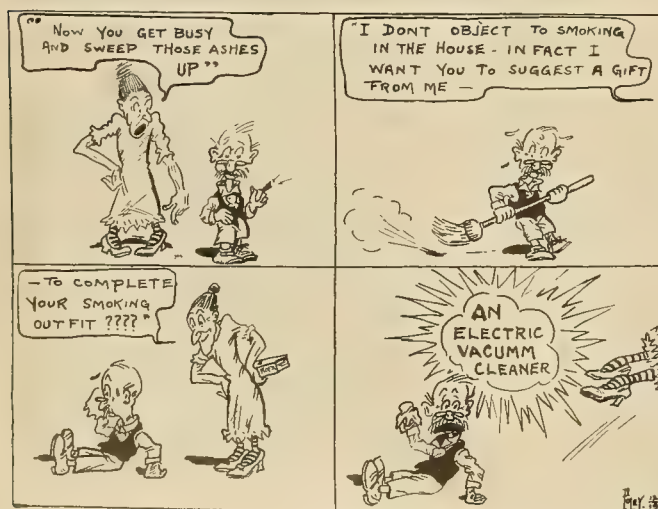
"But this is not the P. G. & E. Company," explained the lawyer.

"Th' hell it ain't!" exclaimed his erstwhile helper.

It's a wise stockholder who knows his own company. But that doesn't affect the moral we started out with.

\* \* \*

Hope springs eternal in the human breast. We hear that the prize in a recent electrical golf tournament was a silver cocktail cup.



Some men are born with electrical appliance appreciation and some must have it thrust upon them. Dad had never been an enthusiast on the "electrical home" idea but evidently his mind changed with remarkable abruptness after a five minutes seance with the broom.

Speaking of accidents, perhaps the insurance companies are a little too general in their interpretation of the word.

An insurance man was putting questions to a former cowboy, as he wrote out his application.

"Ever had any accidents?"

"No," was the reply.

"Never had any accident in your life?"

"Nope. A rattler bit me once, though."

"Well, don't you call that an accident?"

"Hell, no. He bit me on purpose."

\* \* \*

Just for a change we reproduce the following compilation of business virtues as an antidote to the demoralizing flippancy of this page:

Don't trouble your superior with matters which are trivial. Settle them yourself, thereby showing you are big enough to take care of them.

The man above you wants a man whom he can depend upon to handle small matters which otherwise might come before him, and he is going to look around till he finds the right man—so if you can not meet the requirements, some one else gets the job.

The high priced man is not in that position to handle small details. The firm could not afford to pay him for such service, and he has not the time to give to the little matters if he takes care of the larger ones.

The man who troubles him too much with unimportant matters which should not be required of him is due to be dropped when a man with more ability and initiative is found.

Learn to rely on yourself to get out of the little difficulties which arise in your department.

\* \* \*



#### Helpful Hints for the Meter Man—No. 2.

The meter man who finds his Style Plus suit in hopeless condition after making his tour will welcome this idea. The meter should be attached to a spring so that it can be pulled to the reader's very eye by a simple twist of the cane. The overworked condition of meter men has been attributed to the habitual placing of meters in dark nooks and unattainable crannies. It is hoped that this spring attachment plan will ultimately do away with the difficulty.

\* \* \*

Salesmanship is an art rather than an exact science,—you never know just what hard facts you will have to contend with. For instance, there was a salesman who leaned confidently against the door post, produced a new patented device from his bag and opened fire on the housewife as follows:

"I have here a combined paper-cutter, can-opener, corkscrew, button-hook, —"

"Thank you," said the lady, "I have plenty of hairpins," and closed the door firmly in his face.

More successful was the patent medicine man trying to convert the cranky bachelor. Said the bachelor:

"I don't believe in all this patent medicine. New-fangled nonsense, that's what it is. Our ancestors never had any of the stuff."

"And where are they now?" retorted the salesman, triumphantly. "Dead, every one of 'em."



# JOURNAL OF ELECTRICITY

VOL. 44 NO. 7

SAN FRANCISCO, APRIL 1, 1920

PER COPY, 25 CENTS



## Doubling Capacity

**W**E are leaving nothing undone to give our customers satisfactory service during 1920.

The above is a picture of our enlarged Taylor Street Works in Chicago and we are now moving into the new section, which gives us a largely increased output.

We are also building a large addition to our Ontario, California, Works.

These two additions with numerous other changes and betterments will give us approximately double last year's capacity.

And the jobbers are cooperating with us to give the best possible service.



The line of Edison appliances is complete and Pacific States Electric Company make every effort to carry full stock at all times and give a complete service out of all their offices.

Whenever they do not give you prompt service on the Edison line you may know that it is humanly impossible.

**EDISON ELECTRIC APPLIANCE COMPANY, Inc.**

**CHICAGO**

**New York**

**Ontario, California**

**Atlanta**





## ONE BIG REASON for C-H CONTROLLER SUPREMACY

### *The "C-H" Finger*



**D**ESIGN, workmanship and material,—these three have put the C-H Contact Finger on a plane of its own.

This compact finger is a standardized, patented part of many types of C-H Drum Controllers, Compensators, and other D. C. and A. C. Manual and Automatic Types of Starting and Speed Regulating Control Apparatus.

It is non-stubbing and has a slight wiping and rolling action which keeps the current carrying surfaces of the finger and contact segment clean. This is but another result of Cutler-Hammer's 27 years of experience in the design and manufacture of motor controllers.

# CUTLER-HAMMER

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WORKS: MILWAUKEE AND NEW YORK



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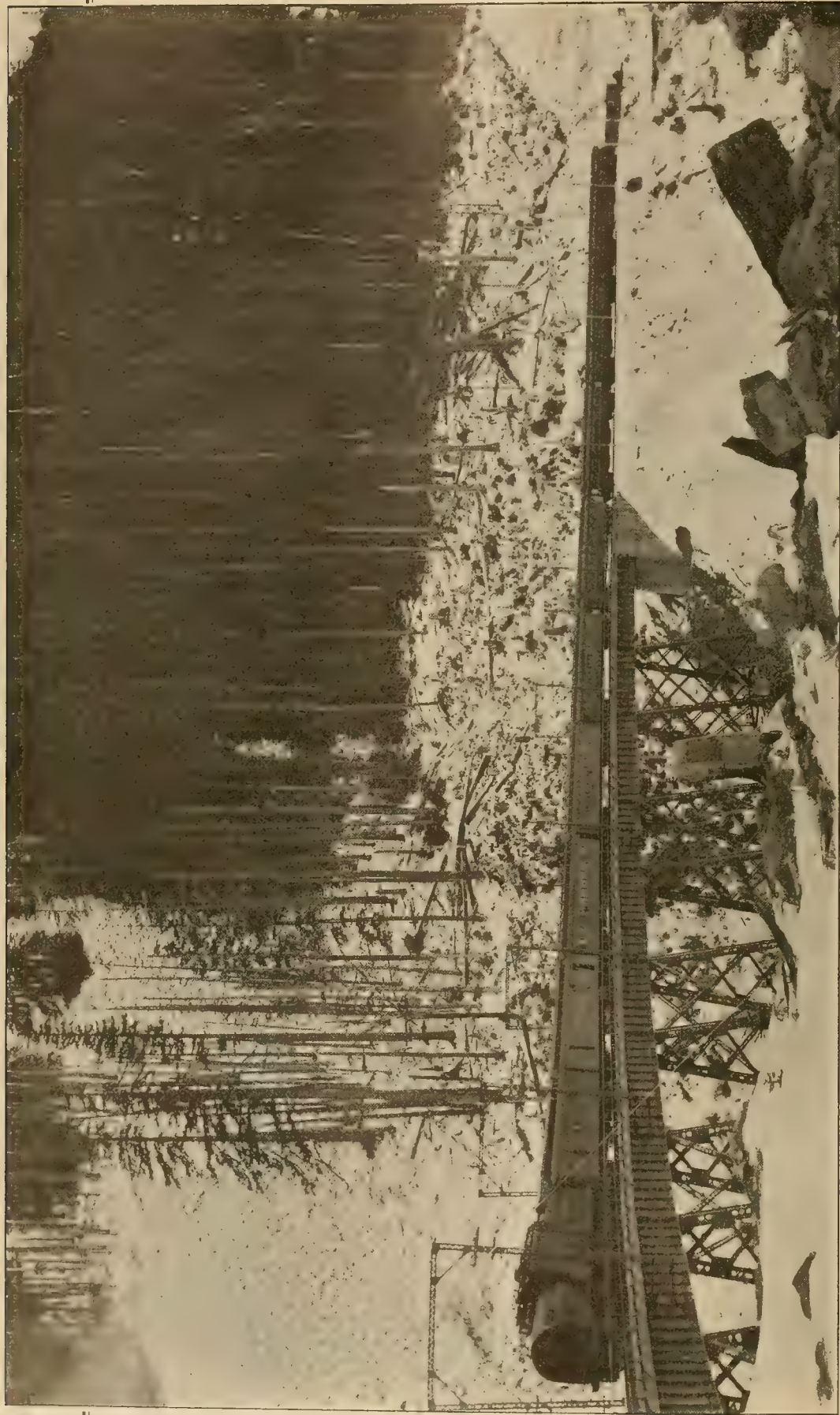
THE ELECTRICAL TRIO:

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## The world's first and only electrified trans-continental railroad

crossing the Cascades and Rocky Mountains. The bridging of the continental divide by an electrified railroad is here matched as a new record in accomplishment by the crossing of the Cascade Mountains in the great Northwest on March 6, 1920. The view shows the Chicago, Milwaukee and Puget Sound Railroad electrically operated in the snow-clad mountains of the Northwest as the train appeared on its recent trial trip.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, APRIL 1, 1920

Number 7

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## The Engineer and Electrical Development Building

“Man hath need of home” is a saying as true today as it was thousands of years ago before the dawn of modern civilization.

In the West where engineering attainment on such a vast and unprecedented scale has ever been the watchword of accomplishment, the need for an engineering headquarters is unusually emphatic. There has been much informal discussion during recent months concerning the building of a twelve to fifteen story edifice in the City of San Francisco to serve as a headquarters for engineering organizations of the West, and also for engineering business institutions and commercial houses closely affiliated with engineering activities. Practically every large concern thus far approached upon the matter has signified an unusual interest, and during recent months public-spirited engineers interested in the enterprise have practically been assured adequate financial support from certain eastern centers to erect a structure of sufficient size to dominate the sky line of San Francisco, should requisite preliminary rentals and long-time leases be secured to make the venture a reasonably profitable one.

With three upper stories devoted to day and night quarters for engineers, both resident in the district and coming in from outside districts of the West; equipped with committee rooms, auditorium, swimming pool, and all features that would lend to business and livableness, such an institution would certainly continue to develop a vigor and health in the engineering profession that has so characterized this young and growing professional life during the past decade in the West.

On another page of this issue of the Journal of Electricity is set forth a preliminary survey of costs and proposed rentals, and it is to be hoped that all who are directly interested will make preliminary application at their very earliest convenience in order that the matter may be disposed of with the vigor and despatch that characterize a venture of this nature.

The project is a big one, the vision is vast, but is again only emblematic of what the engineer of the West dreams and puts into constructive achievement.

On all sides comes the demand for more power in the West. One of the most fertile valleys of California, for instance, that of the San Joaquin river, is at the present time only about twenty per cent developed, and the other eighty per cent is absolutely dependent on hydro-electric power and nothing else. If the companies do not get the necessary money for development the vast San Joaquin Valley will remain untouched.

As brought out in a recent hearing before the California Railroad Commission, there is certainly one thing which must be realized, and that is that there is nothing sacred about money. It is a commodity that will flow where the highest prices obtain. At this particular hearing, evidence was brought to show that the dictum of the California Railroad Commission, given at the beginning of the war to the effect that the corporations of California shall be

kept solvent, has done more to attract the attention of investors to California securities than any other one act of record.

That the people should know the full responsibilities that are today placed upon the electrical industry and the necessity for vast sums of money in this development is the one crying need of the hour. The money, for instance, required in California alone during the next ten-year period is estimated at between \$250,000,000 and \$500,000,000. No authority has placed the amount below the \$250,000,000 mark. How, then, are these vast sums of money to be acquired? Only by the clearest thinking will it be possible, and the people themselves must continually, by every known means of educational effort, be brought to see the clear facts at issue. Thus and thus alone, will the insistent demand for power development be met and our great West go forward unhampered.



It often occurs that land which must be used for reservoir sites or for right of way purposes must be obtained by a process of condemnation. Under existing laws, this means a trial by jury, before whom testimony is presented by both sides as to the value of the property in question. It is natural that the testimony as presented by the owner of the land should allow as high a figure as will seem at all probable, whereas the company desiring to make the purchase will trim down the payment to market value plus some small allowance for forced sale. The usual result is that the jury splits the difference, a proceeding which is far from scientific and usually unjust. It is obvious that the company experts have a lower limit beyond which their estimates may not go. However prejudiced you suppose their testimony to be, the figure cannot be less than zero. On the other hand, the owner may claim the sky as his limit—and sometimes approaches very near it. Supposing both sides to have done their worst, the result of averaging the two is bound to be in favor of the owner.

As a matter of fact, the jury system of fixing values has little to recommend it. In the endeavor of our laws to secure unprejudiced judgments, we often go to the extreme of assuming that in order to judge fairly, a man must know nothing about the matter in hand. Of course, the owner must be protected from unjust seizure of his land, but it seems that the function of the jury might consist in determining that the land should be sold. Neutral experts to appraise the value of the land could then be appointed by the court—an arrangement which does away with the absurdity of an "expert" who is called in to prove one side of a case rather than to arrive at a dispassionate estimate. Market value is a figure not difficult to obtain—and the addition of a fixed percentage allowed for the forced sale brings the price to a fair result which should then be accepted without revision.

Said the Englishman, "Where is my 'at'?" and the American replied, "Where am I at?" And so, when we stop to consider the wonderful new advance in modern science presented in Einstein's theory of matter, or rather relativity, brought out by the recent articles by Dr. A. C. Crehore on the New Physics, which have been appearing in the columns of the Journal of Electricity, we are brought face to face with the question, "What indeed is matter?"

Dr. Crehore has shown in this series of articles in an unusually simple and helpful manner that matter, so far as we know it, may have no existence at all save that of energy. It is quite evident, then, so far as our physical senses are concerned, that they lie to us and we are unable to prove from their testimony the ultimate composition of matter. A consideration of this subject brings up the fact that, in many instances, the conjectures and conclusions of these five senses are indeed unreliable. Our eyes would tell us that the man driving the peg on the

distant mountain side creates a noise by slugging the air in his upward stroke, were it not for the fact that we are familiar from other sources with the phenomena of echo and sound travel. Our sense of feeling has been known to be so strong in the case of imagination, that in cases where students have playfully bound men hand and foot and passed ice over their bodies, telling them that they were freezing to death, death has actually resulted. And so on down, in each case, we may find that these five physical senses lie to us on various occasions.

Hence, may it not be true that all objective phenomena that we observe are at present wholly unknown to us save only by conjecture? There is one thing, however, that we do know independent of the testimony of these five physical senses, and that is that we are conscious, that we have conscious existence, and from this mode of reasoning we see all phenomena presented to consciousness as a direct effect of mind. This would indicate that our physicists are arriving at the inevitable conclusion that all is mind and its infinite manifestation. Thus by examining closely the deductions of Dr. Crehore, in which he proves that matter is nothing but energy beyond a question of a doubt so far as all mathematical reasoning enables us to deduce, we come to the conclusion that energy must be the effect of mind.

The rapid increase in power applications in rural communities, particularly in the West where the number of motors installed for pumping irrigation water is mounting by leaps and bounds, brings out forcefully the necessity for a revision of nameplate ratings to meet the consumer's viewpoint.

#### Rating Motors in Watts

The manufacturer who is first to add to the nameplates of his motors their ratings in watts, or kilowatts, will achieve a decided advantage over his competitors. Salesmen, and other employes of power companies, who meet the consumers, talk kilowatts of generating and line capacity, kilowatts of transformers, bill him for kilowatt-hours and then leave it to his mental agility to convert these to horsepower. It is no small thing; the consumers must be served, and service means, in this case, reasonable consistency of ratings. In practice the change to watt rating can be made with the greatest facility: the horsepower need not be omitted at present, but should be subordinated to the more logical rating which will in time become standard.

A few years ago the Northwest Electric Light and Power Association had a committee on Labor Statistics, which, during its existence, collected a considerable amount of very valuable data regarding labor conditions and wages current at the time, for the various classes of labor employed by members of the association.

The present conditions of high prices and scarcity of labor lead to the conclusion that the appointment at this time of similar committees by the Northwest Electric Light and Power Association

#### Land Appraisal by Jury

#### What is Matter?

#### Labor and Labor Statistics



would be of the greatest benefit to all concerned. In the formation of such committees the scope of their work should be given very careful consideration, as the subject is one that could be handled with good results and one that might, on the other hand, be carried to extremes that would not be in keeping with the best interests of all concerned. The committees should be limited in their activities to the collection and compilation of data regarding the working conditions such as hours of labor, relations with outside organizations, welfare work, and to matters of compensation.

The matter of compensation should, however, not be restricted to what is commonly called Labor, including only such as linemen, operators, mechanics, clerks, etc., but should be widened to include such employes as engineers and department heads. With such an aim in view, and with active committees, alive to the opportunity of promoting the best interests of both employers and employes, the proposition is one which should be backed by every interest.

That the cooperative idea is taking hold in the Northwest is seen in the significant fact that at a late meeting of the Advisory Committee of the Northwest Electric Light and Power Association at Seattle, all of the delegates evidenced a desire for closer cooperation. The cooperative idea, started in California, has reached its greatest development in that state, the results of which will be shown at the various conventions at Pasadena in the middle of May—namely, the Pacific Coast Section, N. E. L. A., May 17, the California Association of Contractor-Dealers on May 18, and the N. E. L. A. Convention May 19-22. To the contractor-dealer the afternoon session of the Pacific Coast Section, N. E. L. A., on May 17, will be of particular interest, for the discussion of Mr. Garnett Young's paper on a campaign for more outlets will take place, and Mr. A. W. Childs will present a paper on appliance solicitors. The California Association of Contractor-Dealers' meeting on May 18 should be attended by all of the contractor-dealers of the Pacific Northwest, since it will give them a golden opportunity to see the working out of the contractor-dealer's side of the cooperative plan and the benefit it has been to him. The men of the Northwest will be able to take advantage of the experiences of the California contractor-dealers in this campaign and take back a working plan that has proven a success.

Mr. L. H. Newbert, who is chairman of the Advisory Committee of the California Electrical Co-operative Campaign will make his report and show in cold, hard, indisputable figures the benefit in dollars and cents, the increase of business and betterment of service to each other, brought about in 1919 by the campaign. Since it has proven a success financially and otherwise in California, the contractor-dealers, not only of the Northwest, but of all the West should be present at Pasadena in May to benefit by the information that will be there, to meet the big men in the electrical business from all over the

United States, and to present the importance of the contractor-dealer movement in the field of electrical industry.

What is probably the first attempt to utilize the aeroplane in hydroelectric construction work is the purchase of a one-ton bombing plane by the Southern California Edison Company to be used in transporting supplies of all kinds over an impassable mountain. The fourteen mile tunnel on the Florence Lake development is to be driven from both ends, since the north portal is located in an inaccessible spot, and the company is confronted with the building of a road to get in materials and supplies. To get away from this expense, which would be some \$2,000,000, it has been decided to purchase a bombing plane, as machines of this type are sturdy and have proved their usefulness in the aerial mail service and in the passenger service between various towns. The vision of the men responsible for this gigantic step forward in construction methods is far ahead of the present, for the success of this experiment will mean the opening up of new projects that have heretofore been considered impracticable on account of their inaccessibility. It will mean that the vast resources of our mountains whose deep canyons and rugged peaks hide many excellent dam and reservoir sites, will be further revealed and exploited by scouting planes of the power companies which will be used in patrolling the high tension lines during most of the months of the year. That such a plan is feasible was shown the other day when an air enthusiast in taking a ride down the San Joaquin Valley noticed a break in a transmission line and on reaching the first town, landed and informed the company's local agent of the exact location of the break.

When the plane on the Florence Lake development jumps off on its first flight to the north it will be an epochal event, and the electrical industry as a whole will be waiting for the news of its success and at the start will truly wish it "Bon Voyage."

During the past fortnightly period the Standard Oil Company of California has announced a raise in the price of oil amounting to twenty-five cents a barrel.

#### The Price of Oil

Viewed from many angles, the necessity for this increase, if such necessity really exists, is unfortunate. The West is at the present time passing through an unusual, critical and trying period, particularly in the supply of electrical energy for industry and agriculture. Not only is this condition acute on account of power shortage due to stopping of new construction work and development of the industry during the war period, but also the shortage in rain and snow in the mountains at the present time predicts an unusual status of affairs in the electrical industry during the next summer. The consequence is that increased oil will be necessary in this industry, for the steam electric plants must be depended upon to



the limit to furnish power. Roughly speaking, it is estimated that the gas and electric industries during the coming year will require some 11,000,000 barrels of oil in order to meet the unusual demand that has just been mentioned. It is readily seen that an additional \$3,000,000 must be absorbed by the people of California in the way of increased revenues in order to meet this raise in oil price, when only this one branch of industry is considered.

This question of raise of prices without control or review from some source or other, aside from the company itself, brings each day to light the necessity for such a control or review, particularly in those instances and in those commercial enterprises, whether large or small, that are dominated to a particular extent by one or two large controlling factors.

The recent period of extreme drought in the far West, particularly in California, which has worked a severe hardship on the agricultural industries of the state as well as curtailing the hydro-electric outputs of the various companies depending on stream flow and artificially created reservoirs, points out the need of intelligent forecasting of the weather farther in advance than has hitherto been attempted in any scientific manner. Weather records as obtained by the U. S. Weather Department over a period of sixty years, and others as calculated from the width of rings in trees many hundreds of years old, show clearly that the period of scant rainfall and the periods of rainfall above normal follow with regular recurrence. These records show that years of drought occur at intervals of from eight to twenty years and that the curve of maximum precipitation also follows a definite curve.

It is therefore only logical to assume that there is some underlying cause for this variation in rainfall, which is caused, on the Pacific Coast, by the centers of low pressure traveling from west to east—in the dry years passing across the country farther to the north. In the periods of super-normal rainfall, the areas of low pressure cross the country much farther to the south.

The Scripps Institution at La Jolla, California, has for a number of years been working on the hypothesis that changes in weather conditions are due to the upwelling of cold water from the depths of the Pacific ocean and have been taking regular records of ocean temperatures and salinity in an area adjacent to the southern portion of California. From the meager records already obtained this institution has forecasted the weather to some extent, and thus far have had their forecast upheld by the precipitation realized.

With the success of this experiment in mind, an extension of the investigations should be undertaken to cover a greater portion of the Pacific Ocean. More extensive investigations should necessarily come under the jurisdiction of some bureau of the United States Government which is well equipped with funds and trained personnel to accomplish the results so much needed.

Should the industries of the far West have available weather forecasts covering a period of some twelve months or so in the future, they would be in a position to equip themselves for the coming emergencies and many millions of dollars would be made and saved for the growing industries of the West.

The Western region is generally looked upon as a non-industrial district, with its attention concentrated upon the development of its natural resources. It is interesting to note, therefore, that this condition is fast being outgrown. According to the latest census figures available, the West contains one-seventh of the population of the United States and at the same time produces one-seventh of the country's manufactures. This does not include such industries as the great fields of mining, lumber and agriculture, nor the recent developments in railway electrification, but represents factories, packing houses and similar enterprises. An idea of what this growth means is seen by the fact that ten years ago there were not more than 200 persons employed in the manufacture of electrical products in one Western state for which figures are available. Today, this number runs into the thousands and more than 200 employes are reckoned in one factory alone.

These enterprises have all grown up to meet legitimate needs of the region. The wealth of raw materials makes it feasible to manufacture close to the source of supply and in consequence a diversified load has grown up in the cities. The mineral riches of the district, combined with the high freight rates, have led to increasing loads in the electric smelting and electro-chemical field where it has been possible for the power companies to make favorable rates. In the purely rural districts certain prosperous industrial centers have grown up where related industries such as fruit packing, refrigeration to provide ice for transportation of fruit, and factories which handle agricultural by-products are dependent upon electricity for power. Elsewhere on these pages appear several articles covering a few of these developments, characterizing a new era of prosperity for the West.

## Special Features of the April 15th Issue

Advance Publication of

### PACIFIC COAST SECTION N. E. L. A. CONVENTION PAPERS

covering various phases of important western problems to be brought up at Pasadena, May 17-18  
The interests of every branch of the electrical industry are  
represented in these important papers



## Railroad Electrification in the West

(Fuel shortage, the cost of living and most other questions of the kind are intimately bound up with the problem of transportation. How electricity is contributing to the solution of this problem is embodied in the following account of the latest advance in railroad electrification in the West, and of the efficiency and economy of this form of motive power for transcontinental service.—The Editor.)

On March 5th the first train was run over the newly electrified coast division of the Chicago, Milwaukee & St. Paul Railroad, marking still another advance in Western railroad electrification.

The new division extends from Othello in central Washington to the shops in Tacoma, and adds 207.4 miles to the 440 miles previously electrified in Montana. Between Othello on the coast division and Avery, Idaho, on the Montana line, is a stretch of 212 miles which, when electrified, will complete a continuous system of 860 miles operated entirely by electricity, and employing about ninety electric locomotives in place of some 250 steam locomotives.

### Type of Locomotive

The new Chicago, Milwaukee & St. Paul locomotives weigh 265 tons, and are designed for handling in normal service a 12-car train weighing 960 tons, trailing against a grade of 2 per cent at 25 miles per hour. For continuous operation they are designed to operate at 42,000 pounds tractive effort at a speed of 27 miles per hour. A special feature of their construction is a new scheme of connections by means of which four of the main locomotive motors are utilized to furnish exciting current during regeneration, thus reducing the size of the motor-generator set used for control, accessories and train lighting. An appreciable reduction in the weight of control equipment is obtained, at the same time providing for effective regenerative electric braking on the down grades. The engineer controls the speed by merely changing electrical connections.

The new locomotives will operate over the section between Othello, Seattle and Tacoma, including 17 miles of 2.2 per cent grade from the Columbia river west. The traffic over this division consists of heavy main line transcontinental passenger trains carrying from 8 to 12 steel passenger coaches, which will be handled over the maximum grades without helpers.

### Sources of Power

All the electric current used in the operation of these trains is generated from water power, supplied by the hydroelectric plants of the Puget Sound Traction Light & Power Company on the west and from the Long Lake plant of the Washington Water Power Company on the Spokane river. On the west side of the Cascade Mountains the former company has three large generating stations, utilizing the waters of both the White river and the Puyallup river. The third plant is on the Snoqualmie. All three are interconnected and have a combined generating capacity of 114,533 horsepower, in addition to the 45,000 horsepower available from an auxiliary steam plant. This system of tied-in plants is in turn interconnected with a similar system of like capacity on the east side of the Cascade Mountains, uniting into one system some 1,500 miles of transmission lines.

The power furnished to the newest electrified section is taken from the Snoqualmie plant and the Long Lake plant, current being delivered to the railroad's transmission lines along its right of way at 100,000 volts, and stepped down at eight substations

between Othello and Tacoma to 3,000 volts direct current, carried over the rails by overhead trolley wires.

### Economies of Operation

Electrification on this and other roads has set a new standard for reliability and economy of operation. It is estimated that electric motive power for railways can be maintained for approximately one-third the cost of that of steam engines for the total train tonnage hauled. For the same freight tonnage handled on the Rocky Mountain division of the Chicago, Milwaukee & St. Paul, electric operation has effected a reduction of 22.5 per cent in the number of trains, 24.5 per cent in the average time per train, and has improved operating conditions so that nearly thirty per cent more tonnage can be handled by electric operation in 80



Snoqualmie falls, showing power plant of the Puget Sound Traction Light & Power Company in the distance. The generating station is 268 feet underground in a large cavern cut in solid basalt. The penstock goes down a vertical shaft and the tailrace enters the canyon of the river just below the falls. This is one of the two plants supplying power to the newly electrified western section of the Chicago, Milwaukee & St. Paul Railroad.





The electrical demonstration special which crossed the Cascade Mountains in Washington on March 5th on the first trip over the newly electrified section.

per cent of the time it formerly took to handle the lesser tonnage by steam engines. The capacity of this line has been increased fifty per cent.

#### Fuel Saving

An important aspect of this Western electrification is the fuel saving involved in the use of hydro-electric power. From operating results obtained on the Chicago, Milwaukee & St. Paul electrified zone, during 1918, and the figures from steam operation during the same period, the following table has been compiled, showing the coal saving to be accomplished by electrification:

Total ton-miles steam.....	1,215,400,000,000
Reduction by electrification.....	146,000,000,000
Total ton-miles electric.....	1,069,400,000,000
Kw-hr. electric at 40 watts.....	42,776,000,000

Coal on basis 2½ lb. per kw-hr.....	53,500,000 tons
Equivalent railway coal, 1918.....	176,000,000 tons
Saving by electrification.....	122,500,000 tons



The Long Lake plant of the Washington Water Power Company on the Spokane river, which furnishes part of the power for the Chicago, Milwaukee & St. Paul electrification. Thus far this company has furnished since last August about eight million kilowatt-hours.



The Cedar Falls substation on the Cascade electrification of the Chicago, Milwaukee & St. Paul Railroad, showing incoming high tension feeders, outdoor 3000-volt disconnecting switches, and operators' bungalows.

In addition to all the advantages of efficiency, economies of maintenance, cleanliness, capacity and so forth, it is shown that approximately 122,500,000 tons of coal, or more than two-thirds the coal now burned in our 63,000 steam engines, would have been saved during the year 1918 had the railways of the United States been completely electrified. It is also estimated that the railways, so electrified, could carry one-fifth more revenue-producing freight tonnage with no change in present operating expenses or track congestion.



## Electricity in Fruit Packing

(In production as well as in distribution electricity is becoming more indispensable every day. Following is an account of the part it plays in both phases of California's great citrus fruit industry, and of the increased efficiency, cleanliness and convenience resulting from its use.—The Editor.)

A new industrial plant in these days invariably means electrical equipment, and the packing house of the Honora Realty Company, recently completed near Exeter, California, is no exception to the general rule.

### Arrangement of Plant —

The building itself is of exceptionally fine design, and has a main working floor space of 85 x 120 feet. The roof is supported by heavy steel trusses, leaving the working floor free from pillars and other obstructions. Three rows of saw-tooth windows facing north furnish an abundance of light and ventilation to all parts of the floor, without any direct sun rays. The windows are operated by mechanical contrivances from the main floor.

In addition to the working space there are offices, rest rooms, lockers and toilets occupying a further space of 60 x 18 feet, all of which are of the most modern type and embodying the very latest conveniences for the comfort of employes.

The main floor of the packing house is devoted to the grading and packing operations, while the basement is utilized for sweating the loose fruit, for the storage of boxes and shooks, and the making of boxes.

Lemons, after being received in the basement, are put through one of the latest improved washers and graders, and are then conveyed to the sweat rooms. After being sufficiently cured they are elevated by means of a stack elevator to the main floor, where they are packed and placed in cars.

The sweat rooms are of the most modern type, and are 32 x 40 feet in size. There are five of these rooms, of about 2000 boxes capacity each.

Oranges, after being sweated are fed, a box at a time, on to an elevator, which dumps them on the sorting tables and automatically stacks the empty boxes.



Electrically operated receiving station. From the time the oranges or lemons are loaded on this conveyor until they are packed, they are not touched by the human hand.

The gas used for the coloring of this fruit is furnished by an outside generating plant and blown into the sweat rooms under pressure, thus eliminating danger of fire.

This house will eventually pack the output of 1100 acres of citrus groves, and in a few years will have a run of nine months per annum, as this acreage is about equally divided between navel and valencia oranges and lemons.

### An Up-to-Date Ranch —

The Honora Realty Company is the owner of the property, generally known as the Levis-Goodale ranch, which has made this packing house possible. It consists of 1400 acres, all in citrus fruits. It is located one-half mile west of Lemon Cove and is on both sides of the Visalia electric railroad and the county paved highway, and is under the management of C. E. Goodale. It requires four Samson tractors and 24 head of mules for cultivation purposes, and 50 men are regularly employed on the ranch, independent of the packing house.

Plenty of water for the ranch is secured for irrigation by a ditch, being one of the first water rights of the Kaweah river. The supply is constant and



Interior view showing the automatic electric sorting and conveying tables and packing bins. The plant is operated with thirteen small motors, and can turn out, with a working force of only fourteen people, one thousand boxes of fruit per day. In addition to the latest in skylight effects, this room has 100 100-watt lamps with X-ray reflectors.

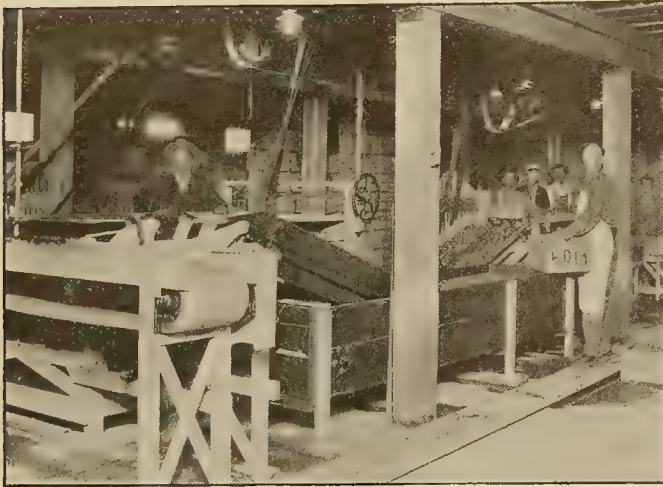
### Electrically Operated Packing Equipment —

The packing equipment, installed by the Parker Machine Works of Riverside, is of the most up-to-date type. All fruit is received into the basement on a belt conveyor and piled on small platforms holding from thirty to forty field boxes, which are moved to the sweat rooms by small transveyor trucks.



sure. The water is pumped from the ditch by two centrifugal pumps (one a 4-inch and the other a 5-inch) to two central distributing points, from where it is conveyed by an underground irrigation system through steel and redwood pipes to wherever it may be needed.

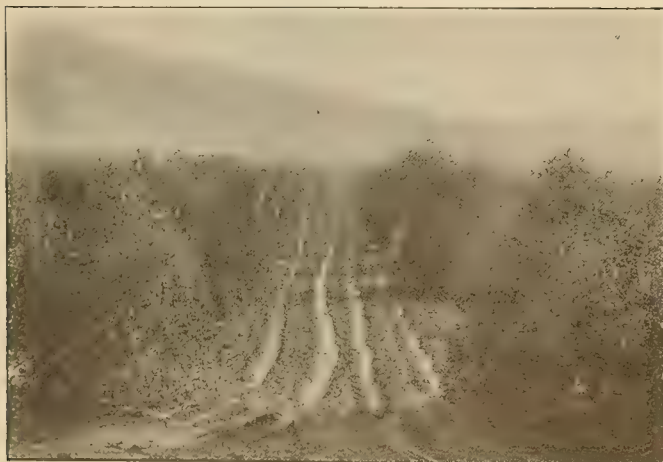
Mr. Goodale has now installed on the ranch sixteen electric motors and pumping plants that furnish power for every farm need.



Lemon washer and polisher, operated by electricity, and handling the fruit at the rate of 1000 boxes per day.

Twelve cottages and two cook houses, having every modern electrical convenience, are provided for housing and eating purposes, and a pool room and recreation room are maintained for the amusement of the employes. There is also a modern ice and refrigerating plant, with a capacity equal to the requirements of the entire ranch; also a blacksmith shop and two machine shops, with skilled workmen. All repairs are made at home. Two barns, garage and office building have full electrical equipment.

Mr. Goodale states that if there were to be had anything electrical that he has not installed, that would save him labor or add convenience to his home, business, farm, or pleasure he would have it.



The orange ranch as well as the packing plant depends upon electricity. Water for irrigation is pumped from the Kaweah river by electrically operated pumps.

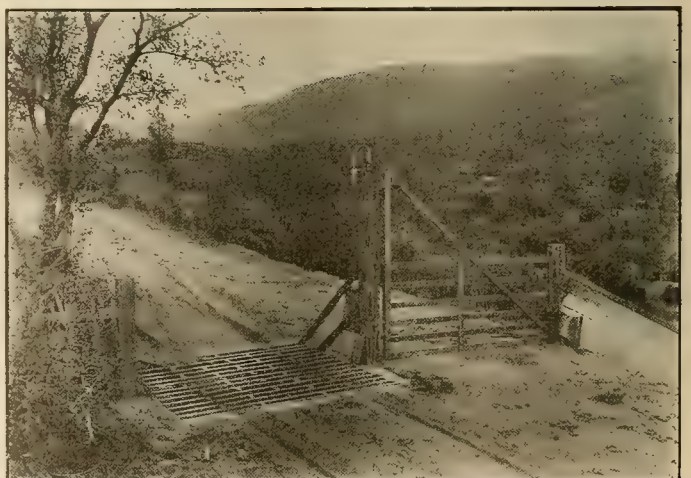
## POWER COMPANY'S SOLUTION OF FENCING PROBLEMS

BY ELMER GATES

Most western power companies find it necessary to provide some guard against cattle that wander on to their mountain properties and often do much damage to gardens and other property. In the California mountains wild hogs are very prevalent and it has been found that during one night they may do damage in uprooting property which is often irreparable. It therefore becomes necessary to develop some means of keeping them off power company property. Fences are of course provided, but the gate problem has proven a very troublesome one. The California method is usually to provide two strands of barbed wire attached to a stake which can be looped over the post at the farther side of the road. This is a source of much difficulty. Not only is it inconvenient and sometimes almost impossible to stop automobiles on the steep mountain grades, but the gates are subject to frequent injury, which is not discovered until the property is already overrun with cattle.

After many experiments, a plan was finally adopted which permits automobiles to pass without inconvenience but which effectually prevents animals from entering the grounds. This is the use of the typical railroad cattle guard, a wooden grid made of 2 by 12 scantlings spaced about 4 inches apart. The surface presented is so narrow that no animal can walk it and it presents so many pitfalls in which a foot may be caught or an ankle broken, that no animal will even attempt to cross it. The grid is made just the width of the road and sufficiently wide to make it impossible for animals to leap it. In order that it may be kept clean and not pack with dust, rendering it useless, it is made so that it fits into a stationary framework and can be removed at will.

The fence of course is brought up to the edge of the grid. In order to provide for the occasional horse-drawn vehicle, the usual gate is inserted directly adjoining. This system has proven so effective in a region where cattle abound and where the use of automobiles is so extensive, that it is being generally adopted.



The typical railroad cattle guard which is being adopted both by power companies and farmers in regions where the use of automobiles is so extensive as to make the use of gates impossible.



## California's New Industry

(The United States is now producing 56 per cent of the world's cotton supply. Furthermore, the climate of California proves to be especially well adapted to the production of this material so that cotton has been added to the state's long list of raw materials. The following account of the industry's rapid growth in the San Joaquin Valley explains the important part which electricity has played in making profitable production possible.—The Editor.)

That cotton continues to play its part in the world's progress is strongly indicated by the incessant demand for cotton and more cotton. After having "done its bit" to help win the war, as the base for manufacture of high explosives, and as the fabric most adapted for airplane manufacture by reason of the very shrinking qualities which had previously made it objectionable, the more stable period of peace and reconstruction has found cotton a material so much in demand that its possibilities as a profitable investment are almost unlimited.

In the San Joaquin Valley, cotton has been added to the list of fruit, oil, grain, lumber, and dairying. It can be used to develop land not now in use, and will thus increase the production of the valley and stimulate the already mounting value of property. It can be used as an intercrop without damage to the orchard or vineyard, and possibly even with beneficial effects.

Electricity is playing its part in growing and preparing the cotton for market. It is giving valuable aid during the world cotton shortage, as a medium for speeding production. First by pumping water for irrigation, then through all the processes of ginning and milling, electricity has speeded and increased production.

### Growth of the Industry

Cotton in the San Joaquin Valley was first grown experimentally in 1913 at Kearney Park, the University of California Experiment Station at Fresno. The results of these experiments were so satisfactory that in 1918 large commercial plantings were made, and further knowledge gained under practical conditions. Land with a medium water table gives best results, and the season is sufficiently long for growing the long staple cotton, which of course demands a premium on the market. The rapid growth of the industry is indicated by the acreage of 1919, which approximated 7,000 acres. It is expected that during the present year this will be raised to treble that value. Climatic conditions are exceptionally good because of the long season during which rainfall is absent. It has been found that wet weather promotes the growth of such pests as the boll-weevil, cut-worm, locust and others. Consequently with the absence of rainfall in the long summer season, these pests are almost unknown in California. Best results are obtained where only one variety is produced in a locality. If short staple cotton is planted near a field of long staple, cross pollinization occurs to the detriment of both fields.

One of the many gins already located in the San Joaquin Valley is shown in the second illustration. This is plant No. 15 of the California Products Company, located at Fresno. The ginned bales are stacked in front ready for shipment to the mills. That the product is much in demand at the present time is

shown by the fact that every effort is made to induce production from all available acreage. Offers are made for certain types of long staple cotton, which include financial assistance for growing and harvesting the crop, as well as the payment of the highest market price at time of delivery, with a guaranteed minimum price of sixty cents per pound.

### Electricity Plays Its Part

After the cotton is harvested and brought to the gin it is handled almost automatically until it makes its exit in completed bales ready for shipment. Here electricity plays its part in the difficult extraction



This electrically operated gin requires only one attendant where hundreds of laborers were needed in pre-electrical days. The seeds, which can be seen scattered over the floor, are taken to the mills and pressed for the extraction of oil. Even the pulp is found valuable in cattle feeding.

of the seed from the entanglement of lint. The electrical equipment, consisting of a fifty and a twenty-five-hp. motor connected to rotary suction blowers and the gins, and a seven and one-half-hp. motor on the hydraulic baling press, was installed by the Valley Electrical Supply Company. Power is supplied by the San Joaquin Light & Power Corporation.

The cotton is unloaded from the cars outside the building by means of a suction conveyor tube which draws the cotton up and carries it to the storage, or to the gins as desired. In the gins, the saws or knives separate the lint from the seed and send each on its journey to the baling machine and the oil press.

At the top of the accompanying illustration can be seen the conveyor tube which supplies the gins. Four of the seven gins installed are shown. The flow of cotton to the gins is regulated by the attendant so as to keep the chamber at (A) moderately filled, but beyond this the operation is entirely automatic. Falling through the opening at (B), the raw product comes in contact with the saws for short staple, knives and rollers for long staple. The seeds are separated from the lint and fall into a trough in the floor. Here a screw conveyor carries them to the



elevator for sacking, or into the adjacent building where the presses extract the oil.

After separation from the seeds the lint passes out the back of the gins and is carried by suction to the baling press. Here it is gathered in a blanket form which folds and refolds into the baling chamber. The baling press is conveniently mounted on a turn-table, so that the process is a continuous one. While the chute is filling the right hand press for the next bale, the last bale is receiving its final compression by means of a hydraulic press, before the baling straps are clamped to hold it in shape. Even the hydraulic press is supplied by electrically driven



The increasing cotton output of the San Joaquin Valley is visualized in this view of a Fresno plant. The ginned bales are here stacked ready for shipment to the mills where a minimum price of sixty cents per pound has been guaranteed.

pumps, located conveniently near the press. As soon as the bale has been strapped it is rolled out and weighed, while the turn-table is swung into position for the next set.

One novel feature of the installation is the use of steam pipes for fire protection. The steam pipes, with suitable valves, are extended into the various conveyor tubes, etc., so that in case of fire the interior of the apparatus can be flooded with live steam. In this way the fire is quickly and surely brought under control before it has had an opportunity to spread. This feature, in addition to a concrete building, reduces the fire hazard to a minimum.

## MODERN PRACTICE IN SWITCHBOARD Design

BY D. H. COLCORD

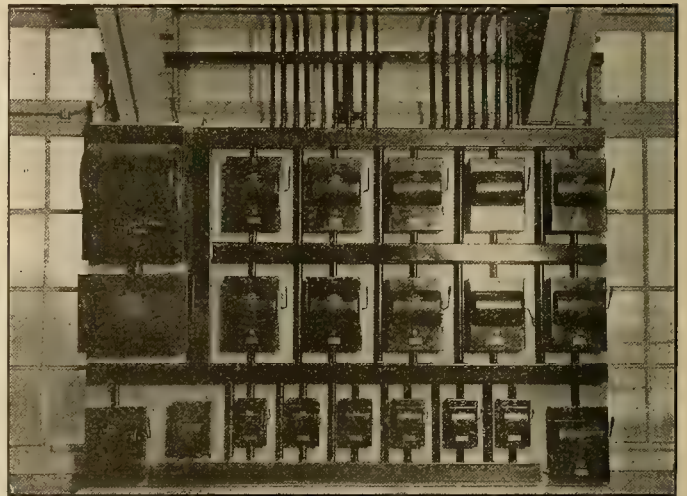
(No industrial plant can operate more smoothly than its switchboard. And because of this very fact it is necessary that switchboard design improve continually to keep pace with the rapid expansion of industrial plants. The following article tells how certain Western plants have installed, at low cost, switchboards which are flexible and at the same time provide a highly desirable safety factor and an efficient control mechanism.—The Editor.)

The two most desirable features in present day switchboard design are flexibility and safety. The unusual exigencies of production during the period of the war required constant readjustment of machinery and plant managers are still compelled to continually shift machinery and apparatus to meet new conditions created by this period of industrial

expansion. Labor shortage requires the employment of operators inexperienced in handling power circuits and consequently control apparatus must be so built and installed as to insure simplicity of operation and a large degree of protection. To procure the necessary flexibility and at the same time to avoid the expense of installing the more expensive type of slate or marble boards, dead front switchboards of unit construction built of pipe, angle iron, pipe clamps, conduits, and steel plates are becoming popular.

Switchboards of this type protect the operators, as no current carrying parts are exposed on the face, and are generally constructed so that all bus-bars and all conductors on the back of the board are enclosed. Furthermore, any motor may be locked out of production at the switch, thus preventing anyone making the contact and starting the motor inadvertently while an employee is making repairs.

Dead front switchboards of unit construction are especially adaptable in small power plants for the control of motor driven auxiliaries, fans, blowers, coal and ash handling machinery, feeders, and distribution circuits. Their advantage for general industrial purposes are that they start motors from one central point, thus eliminating individual switches; they avoid the use of fuses throughout the system; individual motors can be tested and proper readings made without interfering with wiring or



Deadfront switchboards in the Paraffine Company's plant, built of externally operated Square D safety switches. This board is 7 inches high and 10 inches wide. The bottom of the board is 18 inches from the floor and there is an 18-inch platform in front of the board which not only brings the top within reach but acts as a protection from the heavy trucks commonly used in the factory.

shutting down; the operator at any machine can shut down the motor by touching a button; only authorized persons can start motors.

A switchboard that illustrates the value of a unit type of dead front switchboard is the one recently installed by the Pridham Division of the Paraffine Company's plant at Oakland, California. The board was designed for a surface type installation as floor space did not warrant setting the board out from the wall in such a manner as to allow back connections. The frame is built of 2-in. by 12-in. selected pine, surfaced and sanded, and put together with doweling pins and glue.



## Telephoning from the Air

BY ROY J. HEFFNER

(One of the latest adaptations of the radio telephone is its use in reporting fires observed by aerial forest patrols on the Pacific Coast. To the war emergency, we owe the great progress which has been made in aerial telephoning, rendering such useful industrial adaptations possible. The rapid advance and the fundamental principles of operation are recorded here by a major in the aviation section of the U. S. Army who is now chairman of the Technical Department of the University of California Extension Division.—The Editor.)



Figure 1.—The fan-driven generator which supplies power for the airplane radio telephone transmitter is mounted by brackets on the landing gear strut. In this position it is in the "wash" of the airplane propeller.

ONE of the most interesting scientific advances made during the war was the development of radio telephone equipment for airplanes. It came in answer to a vital demand for better aerial communication facilities, after the trial and virtual abandonment of many signaling devices and systems, including message bags, light flares and projectors, smoke bombs, and the like. The radio telegraph was first applied to airplanes, but telegraph operators were human and made errors in code at times when errors could least be afforded. Mainly through the efforts of Colonel

C. C. Culver of the Air Service, army officials were finally persuaded to consider the possibilities of the telephone.

Engineers of the American Telephone & Telegraph Company and of the Western Electric Company had held, in 1915 and 1916, successful demonstrations of transcontinental and transatlantic radio telephony, and appreciated both its advantages and its disadvantages; to them, therefore, the army turned for help. A series of conferences began early in 1917, the ultimate outcome of which was the production, in the latter part of the same year, of standardized airplane radio telephone apparatus. The best brains of the country were put to work on the vast number of problems which almost instantly arose. Patent rights were temporarily thrown into the discard; every idea of probable value was investigated, and if worthy, adopted; the final results were due to the combined efforts of many, spurred by the insistent demands of modern warfare.

The comparatively short period of time which elapsed between the first conference and the final test furnishes very misleading evidence as to the nature of the achievement. Perplexing situations came to light with astonishing rapidity. It was first necessary to devise a suitable source of constant power; then an antenna system for its radiation. The equipment must be compact, light, rugged, simple in operation, and quickly replaceable. It must be mounted so as not to interfere with the operation of

the airplane, but within convenient reach of the operator. The transmitter must minimize all sounds but the operator's voice, and the receiver must be so perfected that its message could be heard above the roar of the engine and the noise of the wind.

### The Problem of Power

Experts had toiled so long designing and perfecting each part of the modern airplane engine, that they refused absolutely to permit any attachments thereto. It was necessary, therefore, to establish a separate power supply for the operation of radio instruments. Small storage cells, made leakproof to withstand aerial acrobatics, proved adaptable for receiving instruments, and for certain low power telegraph transmitters, but were out of the question for radio telephone transmitting sets, which required a potential of 250 to 300 volts. For such purpose a 100-watt, direct current, fan-driven generator was developed, and enclosed in a streamline case to reduce air resistance. On army planes it was found convenient to mount the generator by means of brackets fastened to one of the landing gear struts. Figure 1 shows it so mounted. In this position the small fan is in the "wash" of the airplane propeller. A similar style of generator is used for radio telegraph work. In such type the streamline case contains not only the generator proper, but also the rotary gap, oscillation transformer, and other essential parts of the telegraph equipment.

The necessity for maintaining successful radio transmission independent of airplane speed meant that the generated voltage must be kept constant. This was accomplished by two means—a constant speed aluminum air fan, the blades of which were automatically adjusted by the action of centrifugal force—and a vacuum tube generator controlling the differential field of the generator. Using both schemes at once, fairly constant voltage was obtained at airplane speeds ranging from 50 to 200 miles per hour. The vacuum tube device working alone (with a simple wooden airfan) gave satisfactory results from 60 to 160 miles per hour. The tube was originally mounted in the tail of the generator case, but later it was found necessary to place it elsewhere, excessive breakage occurring from the jars of landing.

Figure 2 shows the electrical connections of the generator. Two armature windings produce, respectively, 25 volts and 275 volts, direct current. The field winding is constructed in two parts, main and differential, the fluxes of which oppose. The filament of the regulator tube is in series with the main field winding, and is heated by current from the 25-volt circuit. The plate potential on the regulator tube is supplied by the 275-volt armature winding, through



the differential field winding. If the speed of the generator increases, for any reason, an increase of current occurs through the main field winding and in the regulator tube filament. The flow of electrons from the filament then increases due to the rise in temperature, causing an increase in plate current.

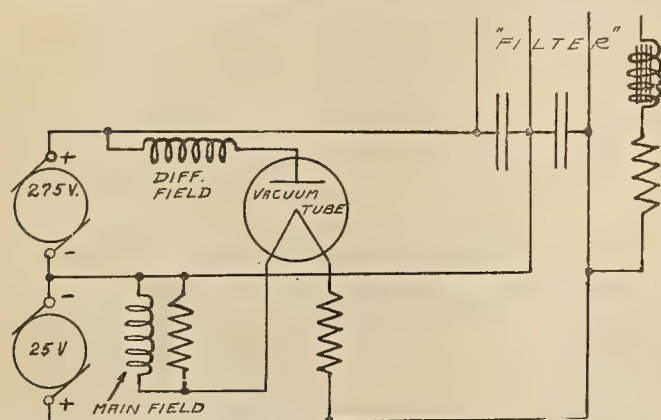


Figure 2—Circuits showing connections for regulating and "filtering" the output of fan-driven generator. The vacuum tube regular system produces practically constant voltage at airplane speeds from 60 to 160 miles per hour.

An increase in plate current, however, means an increase in the current through the winding of the differential field. Voltages and currents are so adjusted that the increase of flux in the differential field just balances the original increase in the main field, and the voltage of the generator is held practically constant. Suitable resistance, inductance and capacity are arranged to "filter" the current from both generator windings, smooth the wave form, and reduce the noise in the telephone receiver due to commutator ripples.

### The Antenna Problem

Another interesting phase of the work was the construction of suitable antennas. No ground connections being possible, the radiating circuit must comprise both antenna and counterpoise systems. Among the many types tried were fixed parallel wires on top surface of upper wings and bottom surface of lower wings; fixed wires strung between points on the wings and tail; single trailing wires, unweighted, of various lengths; single trailing wires, weighted, with reels for winding and unwinding; double trailing wires, both weighted and unweighted, and closed loops in various positions.

Short fixed antennas were not good radiators; furthermore, loops were too marked in their directional effects. In this latter respect trailing antennas also gave some trouble. It was generally observed that ground stations ahead of the airplane received better signals than those on the sides, in the rear, or directly underneath. So many factors entered into the problem, however, that perplexing complications often resulted. Double trailing antennas gave as good results as single trailing antennas of much greater length, hence their fairly general adoption.

Many of the standard types of antennas for ground stations, such as the inverted-L, the T, and the umbrella gave good results for communicating with airplanes. The loop antenna made a good type

for ground receiving sets used in determining the direction of the sending airplane.

It should be clearly evident from what has been said on the subject of airplane antennas that there is much to be done in this field, none of the prevailing types being without very serious objections, some of which might be sufficient to disqualify them for use in actual warfare.

### The Airplane Telephone Transmitter

The problem of transmitting the human voice over a telephone from an airplane without having it completely drowned out by the noise of the engine and of the wind was uniquely solved. Two types of transmitters, one the work of the Western Electric Company, and the other that of the Magnavox Company (of Oakland, California), were developed. No mouthpiece is used, but the metal casing of the transmitter is pierced, in front, by several very small holes (three in number in the latest type). The holes are so dimensioned that they freely transmit sound waves within the range of frequencies covered by the human voice, while undesirable frequencies, such as the noise of the engine exhaust, are virtually damped out. The transmitter is worn with breast-plate and straps similar to those in use by telephone operators. The covering of the Magnavox instrument has holes both in front and in back, on the theory that undesirable sound waves, hitting on both sides of the diaphragm at practically the same instant, produce no effect; whereas the voice of the operator, striking the diaphragm mainly on one side, sets it in motion.

One of the remarkable features of aerial telephony is that the operator cannot hear his own voice above the noise of the airplane, except electrically

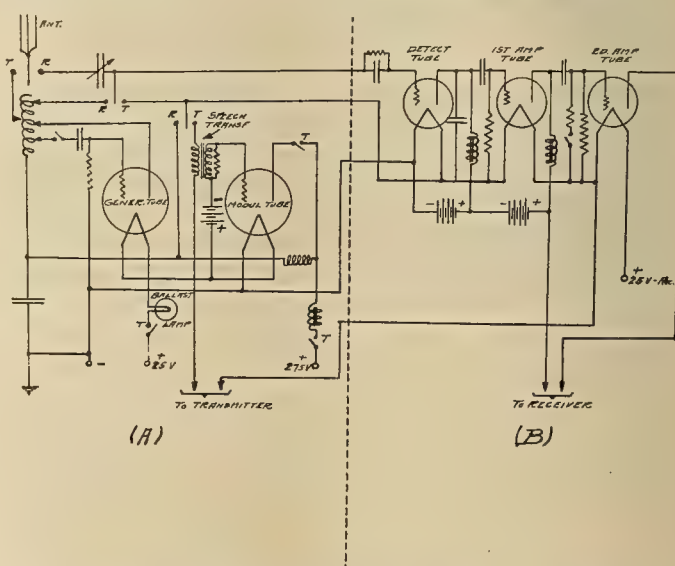


Figure 3—Diagram of the simplified schematic circuits of the SCR 68 type transmitting and receiving set

through his telephone instruments. He is therefore unconsciously tempted to put his hands in front of the transmitter to form a mouthpiece. As a matter of fact, this operation magnifies the engine noise much more than it does his voice, so that the results are far from satisfactory to the listener. The temptation to shout must also be resisted, for when the



apparatus is working well the received sound is normally quite loud.

### The Airplane Receiver

Successful aerial reception of telephone messages presented the same difficulties as did transmission; viz., separating welcome from unwelcome sounds. It was easy to electrically amplify the received signals, but eliminating engine and wind roars was not so simply done, as these sounds seemed to pass through the bones of the operator's head and chest as well as through his ears. Aviators were already wearing helmets for head protection, so the first step was to install telephone receivers inside the helmets. The receivers, which were of the flat or watchcase variety, were then surrounded with soft leather cushions, oval in shape, which fitted tightly around the ears. Experiments with this type of receiver suggested the substitution of a sponge rubber cushion for the leather one, mainly for the comfort of the wearer. For high altitude flying it was necessary to include oxygen-supplying apparatus within the helmet, as well as telephone instruments.

### Radio Principles Utilized

Before describing standard types of aircraft radio telephone sets produced for army use, some of the electrical principles utilized should be mentioned. The simplified schematic circuits of the transmitting and receiving set, known as the S. C. R. 68 type, is shown in Figure 3. A detailed technical explanation of these circuits is not within the scope of this article. For the sake of simplicity the transmitting and receiving circuits are shown as nearly separately as possible. The operation of a switch disconnects the radio apparatus and connects the interphone circuits, so that pilot and passenger may converse. The transmitting or the receiving side of the radio apparatus may be energized by operating a two-way switch. The generator and its regulator having been previously discussed, let us consider the transmitting circuits. Speech transmission is accomplished by the radiation of sustained waves of constant frequency, with with amplitude modulated (varied) by the action of the human voice through the medium of a telephone transmitter; thus the transmitting system may be considered in two parts—the oscillating (or generating) and the modulating. In each part a vacuum tube plays the chief role. The filaments of the tubes are fed by the 25-volt generator

circuit, through a ballast lamp. The plate circuits of the two tubes are fed, in parallel, by the 275-volt generator circuit, through an iron core choke coil which functions to keep the total current supply constant; if then the current supply to one tube should increase, it follows that the supply to the other must diminish. The plate and grid circuits of the oscillating tube are conductively coupled; the antenna circuit is conductively coupled to both plate and grid circuits and receives that portion of the energy supplied to the tube which is not required to maintain the oscillations or consumed in circuit losses. Briefly, the oscillating tube fed by direct current from the generator circuit, produces high frequency alternating current to be radiated through the antenna system.

Three vacuum tubes, one detector and two amplifiers, form the basis of the receiving circuit. The filament of the tubes are fed by the 25-volt generator circuit. Plate voltages of approximately 20, 20, and 40 volts respectively, are furnished by batteries of small dry cells. Incoming signals in the antenna circuit act through conductive coupling to vary grid potential in the detector tube, and thus to vary plate current. Plate current variations of the detector tube are transmitted to the grid circuit of the first amplifying tube by means of voltage variations induced across the terminals of an impedance coil connected in series in the detector plate circuit. The process is repeated between the first and second amplifying tubes. Telephone receivers are included in the plate circuit of the last tube. A button switch is provided to cut out the last stage of amplification if desired. The "envelope" of the incoming signals, when rectified, is a reproduction of the variations produced in the telephone transmitter at the sending station.

### The Standard Sets

The standard types of radio telephone sets which have been designed for the Army Air Service are contained in light, compact, hardwood boxes with hinged covers. The front of the box, which is the operating panel, is made of hard rubber or composition. The apparatus is securely mounted, vibration being reduced by the use of sponge rubber pads and washers. Connections between component parts of the complete set are made by cords, plugs and jacks.

Figure 4 shows the SCR 67 type of radio telephone, used as a ground station for aircraft commu-

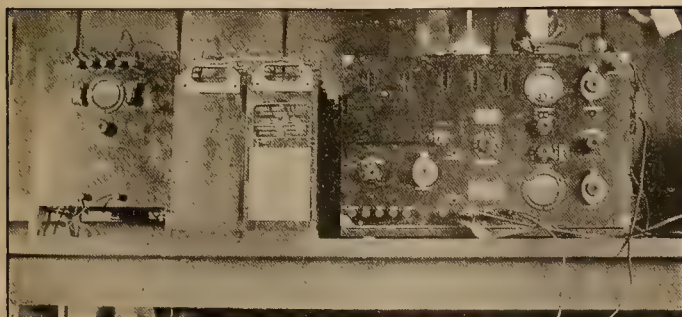


Figure 4—Ground radio telephone set type SCR 67 for airplane communication, including power panel and Edison storage batteries for operating. This is the largest and most elaborate of the Army Air Service radio instruments.

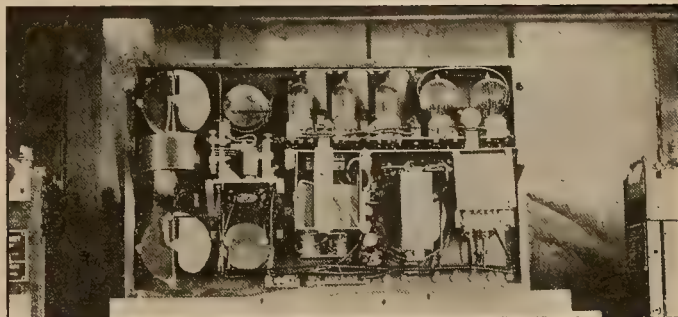


Figure 5—An inside view of the SCR 67 radio telephone set shown in Figure 4. The vacuum tubes which "do the work" are seen in the upper right hand corner. See how every bit of space has been utilized. This instrument gave excellent results from balloons, as well as on the ground.



nication. This is the largest and most elaborate of the standard sets, and includes both transmitting and receiving apparatus. The setbox is shown on the right; Edison storage cells in the center; the power panel on the left. The storage cells feed a 12-volt dynamotor, which generates 300 volts direct current for the plate circuit of the oscillator tube. The set has all the features of the type previously described, plus adjustments for coupling and for tuning both primary and secondary receiving circuits, and a filament current rheostat. The transmitting side has adjustments for wave length, coupling, etc. Meters are included for measuring filament and antenna currents; also jacks to which plug connections may be made for metering purposes. The change from transmitting to receiving circuits is made by a relay, actuated by a push button. The power panel consists of the dynamotor, filter network (as in air-fan generator circuit), voltmeter, fuses, etc.

Figure 5 gives an inside view of the SCR 67 set. The three vacuum tubes in the receiving circuit and the two in the transmitting circuit are seen in the upper right hand corner. Note the compact arrangement of the apparatus throughout. The wiring is insulated by rubber tubing and covered with shellac. The SCR 7 set complete consists of the setbox, power panel, storage batteries, transmitter, receiver, control button, connecting cords, and ground antenna apparatus.

#### Mounting Radio Sets in Airplanes

No radio apparatus, except the generator and fan, should be mounted outside the fuselage of an airplane, on account of increasing the air resistance. The minimum amount of apparatus should be mounted inside the cockpit, and that only in such manner that it cannot possibly interfere with the operation of the airplane controls. All apparatus not actually requiring observation or manipulation in flight was placed, therefore, in out of the way spots; usually fastened to the inside of the fuselage. Great care was always required in mounting auxiliary airplane apparatus of any sort not to weaken any member of the structure by drilling, nailing, or the use of large screws. The setbox, and the interphone box when used, were mounted inside the cockpit, within easy reach of the operator. The setbox was usually placed just underneath the airplane instrument board, in front of the operator. The regular lamp and antenna meter were included on the instrument board.

#### A Forecast

The radio telephone will soon be in general use for many types of communication. Connections between radio and wire systems will be made so that a telephone subscriber anywhere may use the instrument in his office or home to communicate with a friend in the air, on shipboard, in a submarine, on a train, in an auto stage, or in some isolated locality not reached by wire lines. These statements may sound startling, but as a matter of fact, practically every one of them has been experimentally proven, and the system requires only commercial development and improvement. Very good results were attained by the writer while on duty at Rockwell Field,

San Diego, in communicating from his desk telephone through the private exchange switchboard and a radio instrument, to an airplane in flight. There are many reasons why the radio telephone can probably become a competitor of the wire telephone; the mutual interests of the two will be served by their cooperation, each in its particular field.

It is sincerely to be hoped that future development of radio communication will be encouraged and stimulated by all possible means; that legislative control will be protective but not suppressive, and that excessive commercial monopoly of the science will not occur.

### HOW TO COMPUTE PROPER SIZE OF BOILER INSTALLATION FOR A POWER PLANT

BY ROBERT SIBLEY AND CHAS. H. DELANY

(To arrive at the proper size of boiler installation to meet conditions of load encountered in the power plant—either coal or oil fired—is an interesting and timely bit of information to bear in mind when design of steam-power plant installation is under discussion. Herein is set forth a direct and easy method of acquiring this data by direct computation.—The Editor.)

In order to compute the proper size of boiler installation for a given power output, we must know three factors:

- (1) The Maximum output to be anticipated.
- (2) The Overall efficiency of steam mains and power units.
- (3) The Maximum overload to be allowed on boilers in steam generation.

Thus let us assume that 12,000 kw. are desired at the switchboard of a steam turbine installation and that the overall efficiency of steam mains, steam turbine and electric generation is 15%. What boiler capacity should be installed if the boilers are capable of carrying a 50% overload?

Since 1 hp. = .746 kw.

We proceed as follows:

$$\text{Mech. hp. required at switchboard} = \frac{12000}{.746}$$

$$\text{Mech. hp. required to be delivered by boilers} = \frac{12000}{.746 \times .15}$$

Since 1 boiler hp. = 13.14 mech. hp.,  
Total boiler hp. required of boilers

$$= \frac{12000}{.746 \times .15} \times \frac{1}{13.14}$$

Since boilers are to run at 150% of rating, the rating of boilers must be

$$\frac{12000}{.746 \times .15} \times \frac{1}{13.14} \times \frac{1}{1.50} = 5430 \text{ Blhp.}$$

In following the above illustrative example it is to be remembered that the efficiency, including auxiliary losses and every other feature in power plant design, is usually more like 10% than 15% in the modern power plant.



# Service Devices for the Electrical Shop

(All the theories of merchandising ever propounded are not as significant as a half-dozen original devices successfully applied by a progressive establishment. Following are a few interesting features of the Valley Electrical Supply Company's business which not only illustrate the type of service being rendered by contractor-dealers to their customers, but suggest a wide range of possibilities open to the electrical retailer in planning out the details of merchandising work.—The Editor.)

"WHAT THE OTHER MAN DID" sometimes helps sell to the present customer. If it were possible to take the prospective purchaser around to show him the effective house fixtures which have been installed in the new Jones' home, or the wiring job for the Blank Manufacturing Company with which they are so satisfied, it might be simpler to come to exact terms. However, neither the dealer nor the customer has time, and Mrs. Jones would not care to be bothered daily to serve as an advertisement for a firm she paid well to do her work for her.

Much the same result may be obtained by the generous use of photographs. Particularly in the case of business firms which have remodeled their quarters and had new fixtures put in, or who have had an extensive electrical motor installation added to their equipment, the firm is prepared to have commercial pictures taken of the improvement. They

THE MAN ABOUT TO BUILD A HOME is the best possible prospect for electric wiring. The best any contractor could hope to do would be to talk with each prospective home builder before he had made up his mind just what he wanted to do in that regard and have a chance to advise him as to good methods of wiring and the making of proper provision for the electrical appliances which he may wish later to make use of in his household.

Fortunately the building regulations of our various communities provide that all building permits shall be published in the newspaper, so that a complete record is at hand of just such prospective builders. The Valley Electrical Supply Company of Fresno, California, takes advantage of this psychological moment to write this list of prospects, calling their attention to the need for planning the illumination of the new home and sending them a booklet on the "Comforts and Conveniences of Electricity in the Home." The letter which accompanies this literature is as follows:

Dear Sir:

Inclosed you will find a small booklet from which we feel sure you will be able to get much valuable information that we know will help you, and in many cases you will be able to correct mistakes that are invariably made in planning the wiring and illumination in the home.

The services of our engineering departments are at your command. Very truly yours,

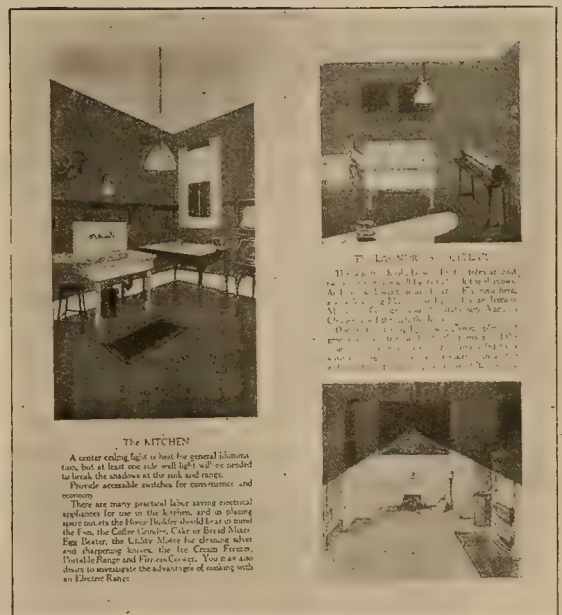
The booklet is one of those provided by the Society for Electrical Development and not only gives suggestions as to what illumination is desirable in the various parts of the house, but also contains figures in the back as to what percentage of light is absorbed by shades of different colors and what reflection can be expected from different wall papers,



A photograph of Warner's Jewelry Store, Fresno, California, after it had been remodeled, with new fixtures installed by the Valley Electrical Supply Company. This is the type of picture which will interest another merchant about to improve his own store lighting.

are more than glad to have a copy of these pictures in the hands of the electrical contractor who has done the work—would in fact be pleased at any publicity he might secure for the installation in the local press or in technical magazines. In some cases where they would not otherwise have thought of a photograph, they will be glad to furnish one if they know good use can be made of it.

Such a photographic record of industrial installations which the electrical contracting firm has carried out—of effective store window illumination for which it is responsible, or store fixtures it has supplied—will make a store photograph album which will be the best of salesmen.



A booklet which carries the electrical message to the home builder, impressing him with the importance of adequate wiring and suitable equipment.



wisely suggesting to the owner that there are technical problems involved even in the matter of selecting fixtures, on which it might be wise to have expert advice. A list of electrical household labor saving devices is appended in the rear, with a very brief description of what each is designed to add to the comfort of the housewife. The name of the Valley Electrical Supply Company is of course, signed to the letter and appears on the front page of the booklet, but otherwise the home-builder is left to his own inclinations in the matter of selecting the electrical firm with which he wishes to deal.

This letter is followed by a second a little later which calls especial attention to the firm's fixture department and offers to send a representative to call on request. This runs as follows:

We understand you are building a new home, and know that shortly you will be interested in the lighting fixtures.

You probably already know that the lighting will need proper attention, for lighting makes or mars the decorative effect of your home. Our representative will call on you personally, if desired, and will gladly give suggestions and quotations.

If it is convenient, we would like you to visit our showroom, which offers an almost unlimited selection of modern fixtures in an adequate variety, both as to design and cost.

Hoping to be able to serve you in the near future, we are,  
Yours very truly,

A third letter form is also available in case the correspondence is carried further, or for use in special cases for which it seems to be more appropriate:

Dear Sir:

I have been very much interested to hear that you are building a new home, and I want to say a word to you about your lighting fixtures—actually the most important comfort-factor in the house.

You are going to live with these fixtures. You are going to spend your evenings with them. Your lighting will be the most conspicuous feature of your home on those occasions when you entertain guests in the evening—when you give a party—or they will be a disappointment. And you want no disappointment in this house if you can help it.

The only satisfactory way for you to choose your fixture is to come right here to our fixture store and see all the designs we have here. You will find ample selections within the price you want to pay, and we can make suggestions as to finish and glassware that I know will interest you.

Won't you make a point of it to come in here the next time you are in the neighborhood? We can show the fixtures and make suggestions we are sure will benefit you and also lend you the assistance of our lighting experience.

Very truly yours,

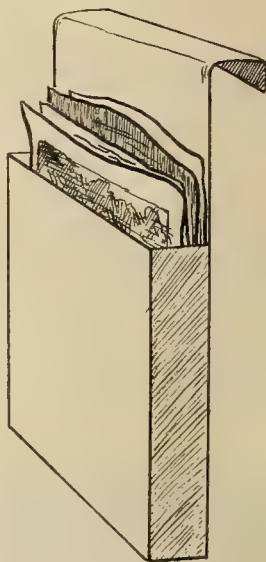
Very good response has been received from prospective builders to these letters, and it is felt that even where nothing can be directly traced to their influence, they often lead to later orders. The owner of a home is the best of all prospects for electrical appliances, and although he may conceivably leave the choice of an electrical contractor to the man who is handling his building work, who may have other affiliations, he will have read the booklet and profited by it, and when at a later time he comes to select the appliances for the new home, it will very likely be the Valley Electrical Supply Company to which he comes.

**KEEPING SILK LAMP SHADES ON DISPLAY** and yet not having them collect dust so that the customer is unwilling to accept them as fresh stock, is a problem which gives considerable trouble at times. It is possible to display some few of them in glass enclosed cases, but the space which can be devoted to these is of necessity limited. Throughout the western valley districts, where the summers are dry and hot, there is always dust to contend with, so that mere dusting will not answer the problem.

The Valley Electrical Supply Company has satisfactorily overcome the difficulty by the use of tracing paper covers for lamp shades. These are made within the establishment to fit the different

types of shades and look most attractive, as well as serving effectively to keep off the dust. The tracing paper is translucent and permits the coloring of the shade to show faintly through. On the other hand, the linen is stiff in its texture and does not require hemming to give a neat finish at the bottom and edges. There are some instances of special lamp shades which require new shields made every so often, but on the whole an outfit of such shields will meet all needs of general stock.

**WASHING MACHINE FOLDERS** are valuable adjuncts to any sales talk. Not only does a supply



A convenient holder

of such literature close at hand give the customer something to read in the case of having to wait, but it enables the salesman to show from the illustrations just how the machine is put together and set up in the home—and gives him something to leave with the customer when she goes out of the store. In consequence it is customary in washing machine merchandising to have such literature conveniently at hand in some form of rack or loose upon the cover of the machine. There is a distinct advantage in having it in some way connected with the machine, as the customer is much more likely

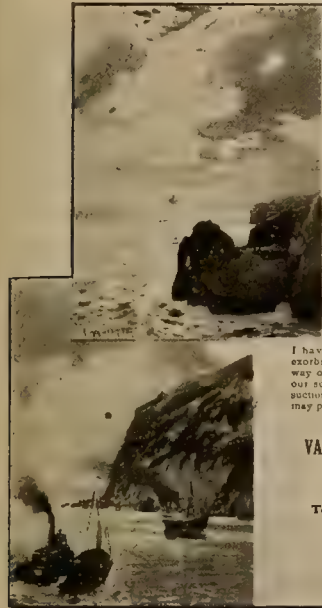
to pick it up of her own accord. A neat little holder which answers this need, without leaving the folders to be scattered about, looking untidy and interfering with the free opening up of the machine to show operation, is to be had in the shape of a little metal box which attaches with a metal hook to the side of the washing machine. This is attached with a metal hook which fits flatly over the upper edge, interfering in no way with the closing of the cover and yet conveniently at hand for all purposes.

**MONTHLY BLOTTERS** are sent out by the Valley Electrical Supply Company to keep customers familiar with their name as a household word. These bear the calendar for the month and an appropriate message for the season's electrical needs, as well as an artistic colored picture of some beautiful landscape. May and June offer the summer's opportunity for the purchase of electric fans; July is devoted to electric equipment for the kitchen and home which will lessen the suffering from heat; October finds a reminder of the value of vacuum cleaners in fall housecleaning and December, of course, suggests electrical gifts for the season.

These monthly reminders have the greater advantage over a yearly calendar in that they come freshly to hand twelve times during the year and do not become forgotten through familiarity. A blotter has the special advantage of being actually put to use. There are few homes where a blotter or a calendar does not find immediate use—and the com-



bination of the two finds its way at once to the household desk. The admonition is thereafter constantly in view, and smoothed over with the householder's hand once or twice every day. This custom of sending out monthly blotters soon comes to be recognized and appreciated by those on the mailing list, who look forward and count themselves in consequence definitely the customers of the store which keeps them so constantly in mind.



**THERE ARE CERTAIN**  
names that in themselves are sure of perfect taste and show pleasure of ownership. Among our extensive assortment of electrical goods are the high quality Hoover sweepers, Thor washing machines and many such conveniences that reduce household drudgery greatly at small cost.

An Exclusive Electrical Store  
**VALLEY ELECTRICAL SUPPLY COMPANY**  
1817 Tulare St., FRESNO

Telephone  
3397

**AUGUST 1919**

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

I have found household assistants that do not cost an exorbitant price and the maintenance is small, is the way one of our pleased customers put it when referring to our superior electrical THOR washing machines, Hoover suction sweepers, and other household-duty-lightenings. You may profit by the experience of this customer.

An Exclusive Electrical Store  
**VALLEY ELECTRICAL SUPPLY COMPANY**  
1817 Tulare St., FRESNO

Telephone  
3397

**SEPTEMBER 1919**

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

Two of the artistic blotters sent out to customers every month, each bearing the calendar for the month, an electrical message and the company's name.

A SIMPLE METHOD of following up time contracts on washing machines is in use by this company. The contract is of course signed and recorded at the time of the sale—and strictly speaking, no further bills are required. It has been found desirable, however, to send out monthly statements to all holding such contracts, stating the amount still due, the amount due as a monthly instalment and the

**VALLEY ELECTRICAL SUPPLY CO.**  
AUDITING DEPARTMENT

Telephone 3397 1817-23 Tulare Street

FRESNO, CALIF. January 1, 1920.

**Mrs. Blank,**

**1415 Eerohoff Ave., Fresno, Cal.**

**\$235**  
Payment on your Contract for **Blue Bird Washer #6324—\$160.00**

is due and payable at this office as follows:

Total amount unpaid .. Jan ..	\$ 137.50
Amount due Jan 1 ..	\$ 12.50
<hr/>	
Total now due ..	\$ 12.50

Kindly note that if you wish to pay the entire balance on or before  
Feb. 1 there will be a deduction of \$ 6.08

The monthly statement of a washing-machine time contract, showing the customer the amount which can be saved by early cash payment.

amount which can be saved by the customer by a payment of the entire sum in cash. This latter statement has been found particularly useful in se-

curing the payment of contracts before the scheduled time. A discount is given up to the last two payments, amounting to five per cent on the money which would otherwise be outstanding. This saving is stated in actual cash terms, however, rather than in per cent, for the reason that it appears a more concrete saving to the customer, usually a woman, to save a deduction of \$5.00 from her bill, than 5%. It has been found that this monthly opportunity to save money by paying up the balance due is often taken advantage of and greatly simplifies the problem of prompt collection.

The importance of prompt collection is often overlooked by contractor-dealers in the press of business—but the tying up of capital in unpaid bills is an extremely unprofitable form of investment. It must be remembered that no sale is complete until the cash is in hand.

## ENGINEERS OF YESTERDAY — 19. VOLTA

A Series Compiled by A. L. Jordan

Who "laid the foundation for an art that was in time to revolutionize the industrial world?"



Alessandro Volta (1745-1827) announced his invention of the "voltaic pile"—a copper-zinc-moistened cloth series—and the "crown of cups"—zinc-copper strips in cups of dilute acid.

Here began the story of current electricity; and this discovery ranks with that of Faraday and Henry—the production of current by other than chemical means—made about 30 years later.

Volta occupied the chair of physics at the University of Pavia, Italy, from 1779 to 1804, and had made other discoveries before this one. In 1775 he brought out the electrophorus, the forerunner of our modern Wimshurst, Toepler-Holtz, or other static induction machines. One form of electrometer is credited to him, and during his controversy with Galvani he showed a number of physiological effects; for example, that two metals in the mouth caused a "taste," and a weak current through the eye produced "flashes of light."

The invention of the voltaic battery placed in the hands of the chemist a new weapon of discovery, and in the same year (1800) Carlisle and Nicholson, in England, had decomposed water, proving the resulting gases to be oxygen and hydrogen. Soon afterward Davy produced by electrolysis the metals sodium and potassium, and the years which followed are filled with the record of the numberless things which Volta's "electric fluid" has done and is still doing.



# The Engineer and the Electrical Development Building

(Herein is to be found a preliminary survey concerning cost and possible rentals that may be derived from an Engineer and Electrical Development League Building. This survey has been undertaken by the Journal of Electricity, and the advice of the best real estate and architectural skill in San Francisco has been consulted. It is, however, to be taken only as a preliminary from which more accurate data can be compiled later.—The Editor.)

In arriving at the cost of the building proposed, it is assumed that the building is to be a fifteen story structure of the most modern and up-to-date design located in a commanding position in San Francisco peculiarly adapted to engineering and electrical development interests. In order to gather more concrete information, a specific lot and cost were ascertained, and all data computed from that basis. The one item that is perhaps more uncertain than any other in the following schedule is that of the question of maintenance, which, due to uncertain labor conditions, has been very difficult to ascertain. However, the basis of one dollar per square foot is the outside figure given to us by one of the largest and best kept office buildings in San Francisco. Assuming that a rental of eighteen cents a foot is to be charged, and making no allowance for revenue from the basement, which, by the way, has already been applied for by one prominent publishing concern for press rooms, the income that may be hoped from such a building is in the neighborhood of 5% per annum. On the other hand, should a rental of twenty cents per square foot be charged, an unusually attractive proposition is open for the investor. Assuming that 70% of the structure is bonded at 6% returns, the remaining subscribed to by proposed stock company of 330,000 shares would have a possible revenue return of something over 8½% on the investment.

## ESTIMATE ON ENGINEER AND ELECTRICAL DEVELOPMENT BUILDING, ON BASIS OF 20 PER CENT RENTALS

Lot 80 x 120	Building, 15 stories
Cost of lot.....	\$ 130,000.00
Construction .....	900,000.00
Total cost,	\$1,030,000.00
5280 sq. ft. area per floor of upper floors.	
8500 sq. ft. area of ground floor.	
<b>Income:</b>	
14 floor, 74,000 sq. ft. @ \$2.40.....	\$177,600.00
Ground floor, 8,500 sq. ft. @ \$3.50.....	29,750.00
Total yearly income.....	\$207,350.00
<b>Expenses:</b>	
Taxes @ 3%.....	\$ 15,000.00
Insurance @ \$2.50 per M.....	1,750.00
Vacancies, 10%.....	18,534.00
Maintenance @ \$1 per sq. ft. ....	82,500.00
Depreciation @ 2%.....	18,000.00
Total yearly expense.....	\$135,784.00
<b>Yearly Profit:</b>	<b>\$ 71,566.00</b>
<b>Interest on Proposed Indebtedness:</b>	
\$700,000.00 @ 6% .....	\$42,000.00
<b>Net Return to Proposed Company:</b>	
330,000 shares at par value of \$1.00.....	\$29,566.00
(Showing return of 8.65% on investment)	

Insistent demand comes from all parts of the West for the establishment of a center of engineer-

ing activity in San Francisco, the business and financial metropolis of the West. An Engineer and Electrical Development Building is urgently needed.

The Editor of the Journal of Electricity, in October, 1917, upon assuming the presidency of the San Francisco Electrical Development League, was the first to urge the construction of such a building, at some central location in San Francisco. Since that time there has been much profitable discussion of the problem, and powerful support has been assured—so much so that if sufficient long-time rentals can be secured in advance, the financing of the project is already practically assured.

The time for discussion has passed. Now is the time for action.

At the beginning of a period of industrial development in the West which has hitherto been unsurpassed, it behooves the engineering professions and trades to organize and centralize, so that they may be in position to take full immediate advantage of all opportunities that will be presented. Let there be one great center of engineering thought and enterprise in San Francisco. Let that be the Engineer and Electrical Development Building—to be advertised everywhere in the West as the first place to seek in order to get into intimate touch with the active agencies of engineering endeavor.

Such a building would gain the financial support of such organizations as the Engineers' Club of San Francisco, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers, American Institute of Mining Engineers, American Institute of Architects, Commonwealth Club, Illuminating Engineering Society, American Chemical Society, the Electrical Development League, California Electrical Cooperative Campaign, California State Association of Electrical Contractors and Dealers, Pacific Division of National Electrical Supply Jobbers Association, Pacific Coast Section of the National Electric Light Association, Electrical Contractors and Dealers' Association of San Francisco, and similar organizations. In this building there should be suitable meeting-places and conference rooms to suit their needs, and an auditorium large enough to accommodate a joint meeting of all the engineering societies, including full arrangements for dining-room service.

This movement to get all engineering interests of the city under one roof merits the support of engineers and contractors; merchants dealing in engineers' equipment, supplies and materials; manufacturers' agents; technical publications. Engineering commissions and executives of the State and National governments should be invited to centralize their activities by securing offices in the Engineer and Electrical Development Building.



# Office Records—Their Filing and Indexing

BY IRENE WARREN

(The filing system should be adapted to the type of material handled. In cases where it is necessary to bring together a number of papers that are not easily alphabetized, or documents which must be kept in the order in which the transactions are handled, the numeric system is frequently found convenient. It is described here in the sixth article of the series by the Director of the Chicago School of Filing and Indexing.—The Editor.)

## THE NUMERIC SYSTEM

The alphabetic plain, the alphabetic with both single and double number codes, and the geographic systems are all alphabetic or based on the the alphabetic arrangement, and they are so planned that one may go directly to the files and get what he wants without consulting an index. It is an indirect method and one can never get materials from the file without consulting the alphabetic card index which serves as a key to the location of the materials.

Every regular correspondent is given a number and the numbers are consecutively assigned to the correspondents as they develop. The test for determining who the regular correspondents are, is the same as in the other systems. It will be seen at once that there are no limits to the extent to which such a system may grow without renumbering of any sort.

### Arrangement of Guides and Folders

The guides used are usually metal tipped with the numbered inserts. The divisions by hundreds—100, 200, 300—are made to stand out clearly by placing them on colored paper inserts on guides which are in the first position. There is a guide for every twenty numbers and these are staggered across in the second, third, fourth and fifth positions, leaving the first position for the hundreds.

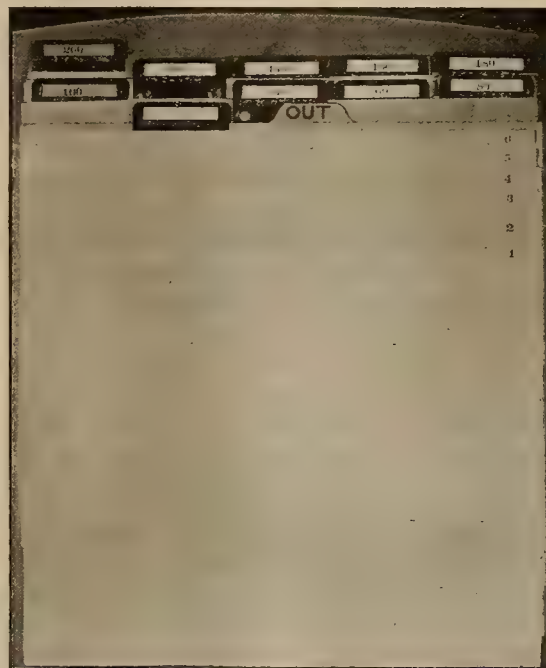
The letters from the regular correspondents are placed in straight edge extension top folders consecutively numbered on the upper right hand tab. A supply of unnumbered folders is kept on hand so that when a correspondent develops sufficient correspondence to demand another folder, the proper duplicate number may be placed on it as well as the dates or whatever other marking is desirable.

When a number is assigned to a regular correspondent, the correspondent's name and address are written on a card bearing the same number. These cards are arranged in an alphabetic index. In large systems the address is needed for identification of the firm as many have the same or similar names. In small systems the cards are often used for the mailing list.

### Marking Letters

The letters are marked in exactly the same style as in the alphabetic numbered systems, the name under which a letter is to be filed is underscored, the cross references indicated, and the important word or words in the letter are encircled. The letters are then roughly sorted alphabetically by the name of the firms so that firm names may be more easily looked up in the alphabetic card index and also so that several people may work on the numbering of the letters at the same time. Each name must be looked up in the card index to get the correspond-

ent's number which is assigned to the upper right hand corner of the letter. There is a check against assigning a wrong number to a new name, because the card taken from the package of unused cards consecutively numbered, and the first unused numbered folder must bear the same number. When the folder is put in the file it must follow consecutively the last folder-number filed. The correspondents' numbers remain the same, year in and year out,



Showing arrangement of guides and folders in the file where the numeric system is employed

with the exception of changes noted later. In some firms, as soon as the file clerk assigns the number it is sent to all those keeping records throughout the firm, so that the customer is known by the same number in the order department, on credit memoranda, on ledger cards, and on various other records.

The cross references for this system are all made in the card index. The various words under which cross references are made are listed on the main entry card.

When the letters are properly numbered, they are sorted by the numbers and made ready for filing. The size of the file determines whether time will be saved by having one or more sortings before the letters are finally filed.

It is a dangerous thing to re-use a number until such a time as the clerk is confident there can be no duplication in current or transfer files.

The folders for the miscellaneous correspondents may be treated in one of two ways. A separate alphabetic plain file may be set up; or, the letters



may be classified by subject and each subject assigned a number exactly in the same fashion as numbers are assigned to names. In many firms, the miscellaneous letters may easily be classified in about a dozen groups.

The numeric system is adapted to:

- (1) Cases, contracts, data of various sorts, drawings and other materials where it is desirable to bring together a considerable number of papers into groups that are difficult to describe in alphabetic terms.
- (2) Such materials as trade catalogs, that need to have many items or parts brought out in each catalog by means of an alphabetic card index.
- (3) Orders, invoices, leases and such materials as it is desirable to keep in the order in which the transactions develop.

The numeric system is less used than in years past because it is much more convenient to go directly to the files for information. There is a certain sureness about this plan, however; the firm has the same number year in and year out; all its materials go under this number and cross references to other names, subjects, or geographic locations are made in the card index. One trained file clerk may mark the letters and attend to the cross references, and assign the rest of the work to very inexperienced clerks with very little education, so long as they are accurate. The clerk may easily attend to all calls for material by consulting the card index, and sending the untrained helpers to get the papers.

Western Ideas

HE WHO GRASPS OPPORTUNITIES stars in the advertising world, as in every other field of life. The ingenious dealer will take advantage of all unusual chances to put his shop before the public.

At one time there happened to be a big chunk of concrete in a vacant San Francisco lot. On this the sign was painted, "Easier Seats Across the Street." On the other side was seen the furniture store, with chairs and davenports attractively arranged in the window.

Another electrical dealer recently had the misfortune to have his window broken. He capitalized this event by means of a card tacked to the wooden boards protecting the window.

"WE SIMPLY CAN'T KEEP THEM OUT—

People are so anxious to buy our Electrical Goods that they fall head over heels into our window."

PRINTED REMINDERS are used by almost every organization under the sun, for there never yet was a society whose members could remember when and where to meet without being told at frequent intervals. The chief problem is to have the printed reminder in a form which will be most likely to make the members obey that impulse and at the same time will involve the minimum of trouble for the overworked secretary.

The blotter idea employed by the Philadelphia Section of the A. I. E. E. is a happy thought. Everybody uses a blotter. Moreover, everybody except the very absent-minded man uses it with the blotting side down and the printed side up, so that the schedule is presented to his gaze every time he blots his signature. The printed schedule of this engineering society includes not only dates, times and

1920	WHEN	WHERE	WHAT
JANUARY	Monday, the 12th	Engineers' Club	6:15 P. M. Dinner at Engineers' Club
	Thursday, the 15th	Franklin Institute	8:00 P. M. Representatives of C. E. and West Co. State Transactions of State and Submarine 8:00 P. M. LEE DE FOREST, Ph. D. Sc. D. The Action in Action and Some Recent Applications
FEBRUARY	Monday, the 9th	Engineers' Club	6:15 P. M. Dinner at Engineers' Club 8:00 P. M. H. FRANCIS A. J. FITZGERALD Electric Furnaces
MARCH	Monday, the 8th	Engineers' Club	6:15 P. M. Dinner at Engineers' Club 8:00 P. M. Mr. H. P. VINCENT of Day & Zimmerman, Opening Preliminary of Insulators on a 1000 Volt System
	Wednesday, the 17th	Franklin Institute	8:00 P. M. Mr. M. G. CLARKE, Insulation Electrical Furnace
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS PHILADELPHIA SECTION—ENGINEERS' CLUB, 1217 SPRUCE STREET			

The blotter which serves as a successful A. I. E. E. reminder

places but programs, too, for several meetings ahead, and if only the well-meaning member will keep one of these useful blotters on his desk he is not likely to miss something he really wanted to hear, and he knows about it far enough ahead to keep the date open—which is not always the case when notification depends on the secretary's postal card.

EVEN A SCRATCH PAD may be employed as an informal publicity agent. A San Francisco engineer, realizing how often an engineer has to make a sketch for his prospect, uses a special pad for the purpose. The inside of the folded sheet is blank for the sketch while the outside bears his name, address and telephone number, so that any kind of a memorandum handed to anyone has the same effect as the leaving of a business card.

This idea might well be taken up by electrical men other than engineers. A contractor-dealer making a notation for a customer frequently uses the back of one of his bills or order blanks, and though this serves to carry the name of the firm to a prospective customer, the special slip which has nothing else printed upon it but the name, address and telephone number, is a more dignified and effective thing. The psychology of impressing a name on the public mind is one of the secrets of advertising, quite apart from the fact that without the little printed memorandum the prospect might easily forget the name of the store.



An engineer's name and address printed on every sheet of his scratch pad serves as a useful memorandum for his client



# The Ready to Serve Element in Public Utility Rates

BY C. E. GRUNSKY

(The presence of a public utility in any district increases the business possibilities of that district to such an extent that the entire community, and not merely the customer, shares in the benefits. The following article points out the equity of adjusting rates with this fact in mind. The author is a well-known consulting engineer of San Francisco and a recognized authority on questions of public rate-fixing.—The Editor.)

Public Utility Rates are not necessarily uniform to the individual rate payers. The rate payer gets more when he is hauled up a hill a mile by a railroad than when he is transported a mile on a level road and yet the charge on any particular railroad is generally the same for these services. The man who lives on a hill in an urban district may get his water under low, unsatisfactory pressure while his neighbor at the foot of the hill, at the same cost, gets a satisfactory service. But the rates as fixed are intended to apply to average conditions in various classes into which those who are served by any utility are, for convenience, divided. The approximation to fairness meets the practical requirement. But, it may be asked, does the rate favor the large consumer? On the unit basis he usually pays less than the great mass of rate payers. The illustration will be equally apt if what the large consumer of electric energy pays, be compared with what electric energy costs the small consumer.

There are several reasons for such apparent inequalities in the rates. Thus, for example, let it be supposed that it is to the interest of the whole community that the establishment of big business be encouraged and that one of the elements to make an urban district attractive for such business and particularly for industrial establishments is cheap water, and let it be further assumed that the supply of water is abundant, that provision having already been made for future demands, there is more water available than actually required. Under such conditions the immediate operating expenses would increase the net earnings of the water company and would, therefore, have the effect of reducing rates. In such circumstances, a graded rate is fair. Giving the large consumer a special, lower than average rate, is, therefore, sometimes legitimate.

And, again, everybody, in the spirit of fairness, is willing to pay for what they get, provided only that the same treatment is accorded to all alike. Consequently, there is rarely any objection to a basic charge for such services as keeping a house connection and a meter in order, reading meters, making out bills and collecting. The cost of rendering such services is independent of the amount of water or gas or energy consumed on the premises which are served. But if for such services, a basic charge is made and to this is added a further charge, proportional to the amount of service rendered or commodity furnished, the small consumer, on the basis of his bill, will find himself paying a somewhat higher price per unit of service or commodity than the large consumer.

It should perhaps be stated in this connection that public utilities generally make provision for

prospective business. Their capacity for service is determined by the requirements of the near future rather than by the immediate demand. Their management looks forward to a time when there will be more industries, more and larger hotels and office buildings, fewer vacant lots, and in general greater business activity and greater demand for the services or for the commodities which the various public utilities supply. Each utility, therefore, increases the potential value of every lot and of every business within the territory which it serves. The street car line, the water and the gas main, the telephone line in close proximity to a lot, whether vacant or improved, add value to the lot. When a public utility is established, an indirect service is thus rendered to a portion of a community or to the whole community which, in the fixing of rates, is generally ignored. The whole community having thus been benefited, why should not the community lighten somewhat the rate payer's burden? The principle is sound; but against its application there will be protest. It is so easy to say, let those who use the electric energy, or the water or gas or street car transportation pay the whole cost thereof, forgetting the indirect but material benefit, reflected in general prosperity, which the utilities have brought to the community. If publicly owned, the utility would pay no taxes. Why, then, should the rate payers served by a privately owned utility pay the tax increment which appears in each bill they pay and in each nickel they drop into the conductor's fare box? Or, the question may be asked, why should not a part of the operating expense of the public utility be paid out of the public treasury, as, in a small measure, is done when a city pays an annual fire hydrant charge and pays liberally for water for public buildings and grounds? And, why should the city accept free telephone service, when it thereby puts a burden on the rate payers?

It is a short-sighted policy which permits a community thus to evade a legitimate obligation. But it is the common practice, and few, in fear of advocating a high tax rate, have the courage to point out its unfairness. It seems all right to those who have not analyzed this question to let the municipality dodge the obligation which it owes to the utility for being ready to serve, and thus place some additional burden on the party who must have the service, and who is not likely to complain—that is, the rate payer. There are some, too, who go further and claim that any ready-to-serve charge is unjust. In the light of what has here been written, this question need not be argued. But it will always be proper to inquire as to what is a fair ready-to-serve charge. Each case in this respect must be judged by the facts which apply.

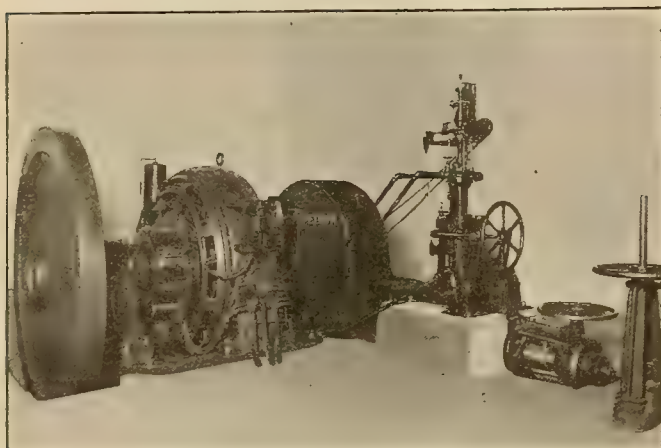


# Water Power Development for Small Plants

BY CHAS. H. TALLANT

(In districts which are outside the congested industrial centers there is frequently a demand for small or isolated hydraulic units which present special problems of design and installation. Following is a discussion of the types of units best suited to particular conditions, and the factors governing their selection.—The Editor.)

Much has been written from time to time about the proper selection of the hydraulic units for large central station hydroelectric plants, but comparatively scant attention has been paid to the subject from the viewpoint of those interested in small or isolated plant construction. The problems of the prospective builder of a small or isolated plant are



Small isolated plant unit equipped with heavy flywheel to neutralize speed fluctuations

often more complex to him than the problems of large construction are to the central station man.

The first considerations in investigating the possibilities of an isolated installation are of course the hydraulic conditions, volume of water, head and length of pipe line, and the probable market for the power to be developed. While these two considerations are not inseparably linked together, they nevertheless bear a close relationship to each other and exert a strong influence upon each other.

A limited water supply might be utilized to supply a small, already developed market, while operations on a larger scale, in which additional adjacent water supplies were utilized, might lead to the development of a much larger and equally profitable market, without too greatly increasing the capital investment. On the other hand, a market might already be developed that could accommodate power development on a small scale or on a large scale, depending on the extent to which it was preferred to carry the development. Obviously this latter case might materially affect the general design of the power house equipment and the performance of the equipment which would be provided by that design. The type of hydraulic prime mover—impulse or reaction turbines—might be affected also, but this is almost always definitely fixed by the hydraulic conditions.

Assuming that the hydraulic conditions are determined, the next step is to determine the type of hydraulic prime mover to use. It is well known

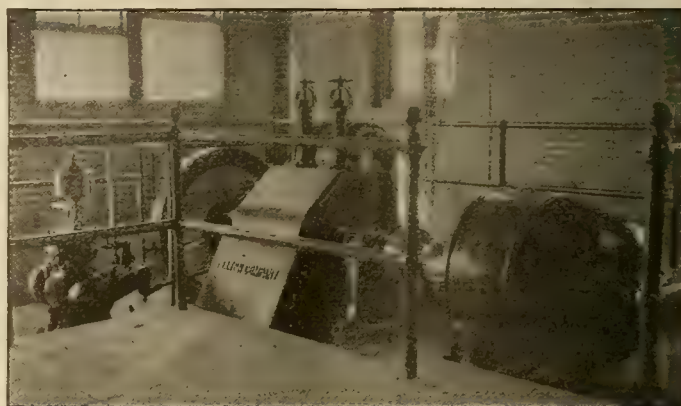
that, as now constructed, hydraulic prime movers are confined to two types, the impulse or Pelton type and the reaction or Francis type. Just where the dividing line in choice of type is located is a matter of some discussion, though there is not a wide area of overlapping. The impulse type is essentially a high head, small volume unit, and the reaction type a low head, large volume unit. The distinction may be more definitely outlined on the basis of "specific speeds," a uniform type characteristic which takes into consideration the variables of head, horsepower and speed. A simple formula is

$$N_s (\text{Spec. speed}) = \frac{\text{r.p.m.}}{\text{head}} \sqrt{\frac{\text{hp.}}{\text{head}}}$$

For values of specific speed up to 9, the impulse type is usually favored. For values above 11, the reaction type, while the values between 9 and 11 represent the field in which either type is permissible, depending on other considerations of local expediency.

## Influence of the Market for the Power on the Prime Mover Design

As stated above, the market for the output of isolated plants has an important bearing on the general design of the plant equipments. It will be



The generating unit at the Ione power plant, constructed with double duplex nozzle—actually four nozzles in all. The installation is for the Preston School of Industry, a state institution of California, where a small stream without appreciable storage capacity is made to furnish power and light to the institution.

particularly important in its effect on the provisions for speed regulation and on the provisions to be made to carry out this regulation to the necessary degree. For example, if the load is to consist almost entirely of a lighting load, with a few scattered small motors, the load curve will be fairly smooth and the changes easily within the control of the turbine governor. In such a case the question of speed regulation is a simple one.

If, however, the plant is to handle a mine or dredger load in addition to the lighting and small motor load, the question of speed regulation becomes



of much more importance. The mine load may include the power for a large hoist. The dredger load, with the heavy scrapers brought practically to a standstill on boulders and then as suddenly returned to normal speed as the boulders give way, approximates the mine hoist load with its sudden starts and stops of the loaded cages. Obviously either of these conditions requires a design that will fully provide for the maintenance of successful speed regulation.

An installation made for exactly this set of conditions is that of the Tin Bentong No Liability tin mine in the Straits Settlements. A 1200-hp., 435-ft. head, double overhung impulse turbine, direct connected to a 1000-kva. generator, furnishes the power for operating the dredges and for the lighting and utility loads. The dredge load takes a considerable part of the total output of the generating unit and during operation puts a sharply fluctuating demand on the unit.

The turbine is a double nozzle unit, using considerable water at the low head, and is equipped with hand operated needle nozzles and stream type jet deflectors. It was necessary, however, to provide in the design for a heavy flywheel to be mounted on the shaft, to take care of the regulation during the sharp fluctuations consequent upon the dredge operation. A delicate governor would respond too quickly and would not accomplish the necessary regulation unassisted when the heavy and sharp peaks and valleys occur.

The unit illustrated is that of a small direct-connected generating unit equipped with a flywheel, for use under conditions somewhat similar to the mine load, but requiring much smaller capacity and less sturdy construction.

Considerations of the market and its effect upon design and regulation becomes of further importance when the power required for the hoist, dredges, pump or similar large units approaches the ultimate capacity of the plant which supplies the power. Such a load on a central station network would be insignificant, as far as regulation is concerned, but on an isolated plant it might constitute 50% or more of the plant capacity, and it would be a very decided factor in the regulation. For this reason it logically follows that to give the same service as the large power company the small plant must have very definite provision made in its design for carrying such loads successfully.

#### Quantity of Water Available

Under conditions where there is an ample supply of water for all the power requirements of the isolated plant, no consideration need be given to the question of providing water storage or of water economizing devices in the turbine equipment. The wheel construction can thus be greatly simplified and unnecessary refinements in the equipment omitted. Continuity of service and minimum maintenance expense must be kept in mind, however, as they are essential factors.

In locations where the original water supply is not ample or where peak loads require a greater volume of water for a few hours than is provided by normal flow, water storage and water saving during

the periods of low load demand are necessary. Careful consideration to the hydraulic and load conditions must then be given and the equipment provided with the necessary devices for economizing on water.

Another set of conditions under which successful power plants are sometimes installed is that where the flow of water varies throughout the seasons or from day to day, and where dependence must be made primarily on the stream flow. Installations such as this require equipment developing uniform high efficiency and complete water economy.

The installation at the Preston School of Industry at Ione, California, is an installation of this nature. A limited and variable stream of water was available but local conditions precluded the use of a storage reservoir, except of a limited capacity.

A 6300-foot, 18-inch pipe line was installed, giving a head of 270 feet. The hydraulic unit which was best adapted to meet the conditions was a double runner, duplex nozzle impulse turbine of 180 hp. capacity, direct connected to a 100-kw. generator. Very close regulation being essential, a governor and flywheel were employed to bring about the desired results. Another interesting feature of the installation is the extremely shallow tail race. The tail race was constructed in this way to permit the utilization of every possible foot of head above the turbine, while still giving sufficient elevation to permit the tail water to flow into an irrigating ditch.

#### Importance of Pipe Line Selection

The selection of the pipe line and pipe is another important factor, though many times it is not given sufficient thought. The pipe line has the power to



A small mountain stream that, with storage, would supply water for an isolated plant.



make or mar the ultimate success of the isolated plant installation, even though every other link in the system is of the highest character. Its influence in speed regulation is of great importance and its economical design, to enable it to perform its functions properly, is needful of thorough study.

In regard to the influences of the pipe line on speed regulations it should be borne in mind that the very finest governor cannot achieve the impossible, and must be supported in its functioning by the capabilities of the pipe line. The law of gravity is the governing law of hydraulics and if the pipe line tends to unduly impede the flow, the governor cannot overcome the impediment.

Suppose a governor makes its full stroke in 2 seconds. The pipe line must be so laid out that it will insure an ample supply of water being delivered to the turbine at that rate of governor movement. If the pipe line will not permit the entire water column to accelerate at least as rapidly as the governor operates, a call by the governor for full water supply in response to a sudden load demand will not have the desired result, no matter how capable the governor itself may be.

A careful study of each individual case should always be made, using an authentic profile of the proposed pipe line. The proportioning of the pipe diameters is directly dependent on the shape of the profile, and should never be made without due regard to it.

## Factors in Plant Design

A brief summary of the important points to be considered in the design of isolated hydroelectric plants may be made with the following diagram.

### Storage

Influence on the turbine design.  
Relation to seasonal variable flow.  
The influence of load factor on size of reservoirs.

### Pipe Line

Influence of the pipe line profile on speed regulation and water column acceleration.  
Influence of operating conditions on pipe diameters.  
Anchorage of pipe sections.  
Type of pipe and joints.  
Necessity for expansion joints.  
Installation of air valves.

### Type of Hydraulic Prime Mover—Impulse or Reaction

Head  
Load factor.  
Speed regulation.  
Relative efficiencies.

The use of expansion joints is a question that often comes up in connection with isolated plant design. Generally speaking, expansion joints have been found to be expensive, though sometimes necessary. Unless the pipe line is frequently emptied and is greatly exposed to the sun when empty, expansion joints may not be necessary. The steady flow of water usual in power pipe lines maintains a sufficiently constant temperature generally to obviate the necessity of installing expansion joints.

# The Record of 100 Dam Failures

BY LARS JORGENSEN

(The following records relating to failures of dams constitute a valuable compilation of data, the first instalment of which appeared in our issue of March 1st. The author, who is a prominent San Francisco engineer, has made a special study of this important subject.—The Editor.)

## STRAIGHT GRAVITY DAMS

1799—Dam del Gasco, Guadarrama river. Two walls 9 ft. thick connected by cross walls. The compartments filled with clay and stone. During a flood water overtopped the dam, swelling the clay, and forced over part of the front wall. Wegmann.

1881—December—The Habra Dam, Algiers. Masonry dam, 110 ft. high, 1066 ft. long. Faulty construction and great flood. 209 lives lost. Wegmann.

1887—November 2nd—Reservoir dividing wall at Little Rock, Ark. Rubble masonry 36 ft. high, 12½ ft. thick at bottom, 7 ft. at top. Wall poorly constructed.

1893—March—Water Power Company Dam at Des Moines, Iowa. Concrete dam. Ice. Undermining and faulty construction. Engineering Record, April 15, 1893.

1895—October 10th—Scranton, Pa. Rubble masonry dressed with granite faces filled with concrete and strengthened with stone buttresses about 24 ft. apart. Wall 10 ft. thick at base; depth of water 20 ft. 120 ft. gave way after having been in use for 10 years.

1895—April 10th—Los Angeles Dam, Calaveras County, California. 400 ft. long, 52 ft. high, 35 ft. thick at base, top 3 ft. Rubble masonry. Undermined.

1895—April 27th—Bouzey Dam near Epinal, France. Masonry dam 1700 ft. long, 49 ft. above river bed. Failure due to great tension at the upstream face. Great loss of life and property. Wegmann.

1899—April 30th—St. Anthony's Falls Water Power Company, Minneapolis. Coursed ashlar sandstone masonry. 530 ft. long, 18 ft. high, 12 ft. thick at base, 5 ft. at top. Ice pressure. Engineering Record, May 13, 1899.

1900—April 7th—Austin, Texas. 1275 ft. long, 68 ft. high, 66 ft. thick at the base. Masonry dam. A freshet and great depth of water flowing over the crest forced 500 ft. of the dam down the river. Damage \$500,000. Cost of dam \$1,400,000. Engineering Record April 14, 21, May 19, June 30, July 28, 1900.

1901—December 29th—Anderson, S. C., and Columbus, Ga. and Montgomery, Alabama. Masonry dams. Freshet Dec. 29, 1901; also green concrete. Engineering Record, Jan. 11, 1902, also April 2, 1904.

1902—March 12th—Manchester, Conn. 175 ft. long, 30 ft. high. Masonry dam. About 50 ft. was moved along bodily by force of water before overturning. Muskrats burrowing under foundation. Engineering Record, June 21, 1902.

1904—November 2nd—Winston, N. C. Small distributing reservoir, 34 ft. high, brick dam. Wall overturned, being too weak. Poor design. Engineering News, Nov. 17, 1904.



Over 100 lives were lost by the failure of the dam at Austin, Pa., and a large amount of property irretrievably destroyed



1911—September 30th—Austin, Pa. Solid masonry. Built on poor foundation. Slid downstream and broke. Over 100 lives lost.

1912—April 1st—Oswego, N. Y. Low masonry structure resting on a crib sunk in gravel was undermined. Engineering Record, April 13, 1912.

1912—April 5th—Owasco Lake dam. Masonry structure, rectangular gravity section 10 ft. high, undermined after prolonged period of leakage. Engineering Record, April 27, 1912.

1912—April 8th—Rockport, N. Y. A masonry dam, weakened by pressure of a heavy ice jam during the previous winter was overthrown by a spring freshet. Engineering Record, June 22, 1912.

1912—May 20th—Lincoln Pond dam, Essex County, N. Y. 25 ft. high. Poor engineering and construction. Dam built of cobble, stone cement and gravel. Slid on smooth rock foundation. Considerable damage. Engineering News, June 6, 1912.

1912—July 15th—The Bow River dam near Namaka, Alberta. A concrete dam, failed July 15th due to undermining of the gravel foundation. Water penetrated a fracture in the inner apron caused by ice thrust during previous winters. Engineering Record, Oct. 5, 1912.



Sweetwater dam, an example in which there was no failure of the dam, but the abutments of blocky and decomposed porphyry gave way during the floods of 1916. An example of the difficulty of getting abutments at the sides of a canyon sufficiently firm to resist arch action. This structure is too thick to act as an arch, and has a gravity section.

1912—November 30th—Nashville, Tenn. 34 ft. high. masonry wall slid out together with a section of the limestone foundation. Engineering Record, Nov. 16, 1912.

1912—October 30th—Port Angeles, Wash. Concrete dam. A blowout 40 ft. wide and 60 ft. or more deep, through the porous gravel underlying the dam. Engineering Record, Nov. 30, 1912.

#### CURVED GRAVITY DAMS

1802—April 30th—The Puentes Dam, Guadalantín river, Spain. 925 ft. long, 164 ft. high. Masonry dam, polygonal in plan, being convex upstream. Failed by undermining, not crushing. Was built on piles in gravel bed. 608 lives lost. Damage, \$1,045,000. Wegmann.

1836—The Elche Dam, Rio Vinolapo, Spain. Curved masonry, 76 ft. high, 230 ft. long on crest. Upstream radius 205 ft. Broke a piece off due to great flood passing over it. Wegmann.

1891—January—Housatonic Dam, near Birmingham, Conn. Curved masonry dam, 636 ft. long, 40 ft. high, 25 ft. thick at the base and 8 ft. at coping; cost \$264,000. In 1869

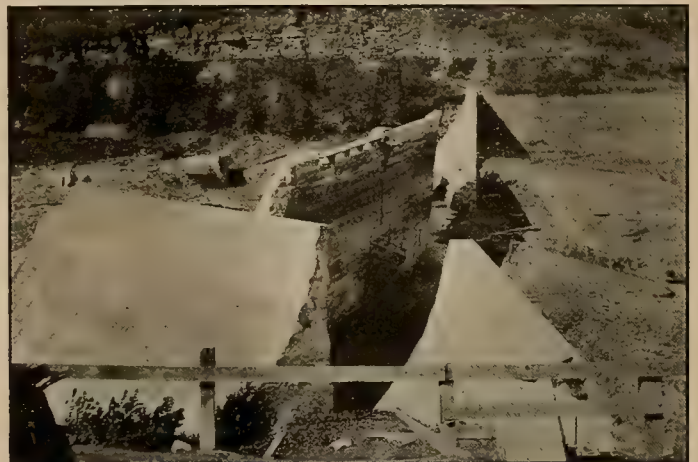
while under construction, heavy freshet carried away 160 ft. of the partly finished work and scoured out a cavity 20 ft. deep in the river bed. This cavity was filled with loose rock and a timber apron filled with concrete was placed upon it. Twenty-two years afterward 250 ft. of the dam was swept away by undermining the loose rock under the timber apron.

#### ROCK FILL DAMS

1890—February 22nd—Walnut Grove Dam near Prescott, Arizona. 400 ft. long, 110 ft. high, 140 ft. at base, 10 ft. at top. Rockfill with timber lining on waterside. Water flowing over crest of dam. 150 lives lost; damage, \$800,000.

1893—August 6th—Pecos River, 6 miles above Eddy, N. M., 1,040 ft. long, 45 ft. high, 21½ ft. wide at water level and 6½ ft. on top. Upstream slope 1½ : 1 of rock faced with earth, sloping 2 : 1, and the down stream slope 1 : 1. Engineering Record, August 26, 1893.

1916—January—Lower Otay dam near San Diego, Cal. Top width 16 ft.; side slopes 1½ : 1 with steel diaphragm located on the line of the top above the water slope, allowing free access of water pressure to that plane, leaving the rock-fill below the diaphragm the sole dependence for stability. Failed by water overtopping the structure. Engineering News, Feb. 3 and 17, 1916.



Failure of a solid masonry dam at Austin, Pa., on September 30, 1911. The dam was built on a poor foundation and slid downstream and broke.

#### STEEL DAMS

1908—April 14th—Hauser Lake, Missouri river. Steel structure. 630 ft. long, 70 ft. high. Upstream toe a rubble masonry fill with steel sheet piling to hard river ground. Water passed under rubble masonry. Engineering News, April 30, 1908.

#### TIMBER DAMS

1892—December—Tacoma, Washington. Timber dam 120 ft. long, with 17 ft. of water. Dam was undermined. Built on yielding material. Engineering Record, January 7, 1893.

1890—August 27—Northfield, Vermont. 100 ft. long, 25 ft. high. Timber. No engineer was employed for the design and construction.

#### REINFORCED CONCRETE DAMS

1909—January 7th—Ambursen dam, Ashley dam, Pittsfield, Mass. 400 ft. long, 40 ft. in height. Water undermining the dam. Engineering News, April 1, 1909.

1909—December—Canaseraga Creek, near Dansville, N. Y. Reinforced concrete. High water. Engineering Record, January 1, 1910.

1912—January—Janesville, Wis. Reinforced concrete dam. The water, although having a head of only 9 ft., forced a passage through the underlying sediments, and undermined about 50 ft. of the dam without damaging the structure itself. Engineering Record, Jan. 13, 1912.

1914—January 15—Stoney river dam, reinforced concrete, Ambursen type. Five bays slid out due to undermining. 1065 ft. long, 51 ft. high. Engineering News, Jan. 22, 1914.

1916—May 15—Plattsburg dam, hollow reinforced concrete, at West Brook, N. Y. Water percolating under foundation and destroying same. Six bays or 90 ft. in length were torn out and washed down stream. Dam 94 ft. high and 330 ft. long. Engineering News, June 8, 1916.



## Electric Power—"Farthest North"

BY ALLEN E. RANSOM

(So indispensable is electricity to the successful carrying out of large enterprises that heavy equipment is transported over miles of snow fields, mountain passes, rivers and ocean. The following interesting account of electric dredging in the gold fields of the far north gives some idea of the extent of these enterprises and the part played by electricity in their working out.—The Editor.)

After the first rush of gold seekers to the fields of "The Klondike," which have yielded up over 300 millions in gold, operators put over twenty-five million dollars into hydroelectric and steam turbine plants, with miles of ditches and powerful hydraulics to scrape the Klondike river from source to mouth for its hidden wealth.

### The First Comers —

Among the first of these was the Yukon Gold Company, which installed, a few miles from Dawson, a hydroelectric plant of 1875-kw. operating under a 650-ft. head, and consisting of three 54-inch Pelton water wheels each direct connected to a 625-kw., 2200-volt, 3-phase, 60-cycle, 450 r.p.m. a.c. generator with 17-kw., 125-volt exciters, and controlled by a six panel switchboard with a voltage regulator, all of Westinghouse manufacture. The current was stepped up from generator voltage by nine transformers to 33,000 volts.



The Northwestern Light, Power & Coal Company's special railroad over which the 10,000-hp. plant from Coal Creek was shipped out to be transplanted to Japan.

With 36 miles of main line transmission and 18 miles of branches, this company supplied energy for nine electric dredges, each utilizing from 300 to 500 hp. and capable of handling from 5000 to 7000 yards of thawed gravel per day during the dredging season, which extends from May 15 to November 1 each year. With gravel running from \$0.10 to \$1.00 per yard and sometimes richer, and only four men required on a shift, the short operating season yields rich returns.

Following this development came that of the Canadian Klondike Company, which, having located a water power on the North Fork of the Klondike river, about 26 miles above Dawson and within 175 miles of the Arctic Circle, installed a 10,000-hp. hydroelectric plant. The electric equipment consisted of two 3000-kva., 2300-volt, 60-cycle, 3-phase, 514 r.p.m. a.c. generators direct-connected to 5000-hp., I. P. Morris-Francis reaction turbine wheels; one 85-kw. exciter direct-connected to a 36-inch water

wheel and one 85-kw. motor generator exciter, together with six panel switchboard and two banks of step-up transformers from 2300 to 33,000 volts, each bank consisting of three 1250-kva. OIWC transformers.

### Operating Electric Dredges —

At Bear Creek a step-down station of 3500 kw. was built to supply the various dredges in the district. Later, a 500-kw. steam turbine auxiliary was so connected through step-up transformers of equal capacity, that at least one dredge could be operated by steam power ahead of the others at the beginning and end of the season. This plant being located farther north than the Yukon Gold Plant, the company found it necessary to install electric heaters at the intake, and at intervals of about two miles in its six-mile power ditch, and also in the receiving chamber at the penstock heads to keep the anchor ice thawed out.



Floating equipment down the Yukon on barges. All types of locomotion were necessary to overcome the excessive transportation difficulties connected with electrical dredging installations in the Klondike.

This company operated four dredges, three of which were much larger than those used by the Yukon Gold Company, having a capacity of 10,000 to 12,000 yards per day.

At Bear Creek Station a physical connection was made with the system of the Yukon Gold Company and the two systems operated in parallel, but for a number of years this plant carried both systems.

### A Transportation Record —

The 10,000-hp. plant of the Northwestern Light, Power and Coal Company was a Westinghouse steam turbine station, located at Coal Creek about 45 miles down the Yukon from Dawson.

The equipment for this station was shipped largely by the British Westinghouse Company, at a great expense from Manchester, England, across Mexico to the Pacific, and via the San Francisco water route to Skagway and St. Michaels and then by the White Pass Railroad, a thousand-mile trip



down the Yukon and partly over the 600-mile Snow Trail in winter. The plant was finally installed by a 60-mile, 33,000-volt transmission line with the Dawson systems. It was intended to supply dredges in addition to the existing equipments, but owing to legal difficulties and the lack of coal at the supposed mine at Coal Creek, after an investment of over \$2,500,000, if only operated 100 days. It was not destined to rust and rot, however, for the whole plant, piece by piece to the last rail, was dismantled and shipped to Japan, where it now adds its output

of kilowatt-hours to the growing paper mill industry in that country.

This group of electric stations with their 25,000 hp. of generating equipment and 10,000 hp. of auxiliary apparatus, located practically on the Arctic Circle and "farthest north" of any similar installations in the world, have operated for fifteen years and have added over \$150,000,000 of gold to the wealth of the world, besides extending literally to the farthest corners of the earth the prestige of electric power.

## The Multi-Stage Impulse Turbine

BY WILLIS T. BATCHELLER

(The study of the structure and theory of operation of the steam turbine is complicated by the great variety of types and makes which have been brought to perfection. The characteristics of the multi-stage impulse turbine are here described in the third of a series of articles by the electrical engineer of the Seattle Lighting Department.—The Editor.)

In the multi-stage impulse turbine, a number of wheels are arranged in successive chambers with a set of nozzles between each chamber for expanding the steam and increasing its velocity before it impinges on the blades of the succeeding wheel. In this way the total heat drop is divided into a number of steps, thereby reducing the heat drop in any one stage and correspondingly reducing the velocity of the steam jet and wheel periphery. The speed of the turbine is reduced to a value which allows it to be directly connected to the apparatus which it is to drive.

The Kerr turbine is an example of this type of turbine. The Curtis turbine is similar, with the single exception that the first stage has two rows of revolving blades with a stationary row between.

### Nine-Stage Impulse Turbine

We will now take the case of an ideal nine-stage impulse turbine operating under the same steam conditions as before, with the exception of the exhaust pressure which for this case will be 0.732 lb. absolute corresponding to 28½ in. of mercury.

Neglecting friction, the velocity of the steam issuing from each nozzle is dependent upon the heat drop in the nozzle. In the case of the nine-stage turbine, the heat drop per stage will be one-ninth of the total heat drop.

The initial heat contained in one pound of steam is 1270.5 B.t.u. as before, and the final heat is now 890 B.t.u. after the steam is condensed.

The total heat drop is  $1270.5 - 890 = 380.5$  B.t.u.

and the heat drop per stage  $\frac{380.5}{9} = 42.3$  B.t.u.

The initial velocity of jet from each nozzle is

$$V = \sqrt{\frac{H_1 - H_2}{N}} = 1456 \text{ ft. per sec.}$$

With a peripheral velocity of 450 ft. per sec. and an angle of the nozzle with the plane of rotation of 20 degrees, the final velocity of the steam after leaving the first set of moving blades is 1055 feet per second. The kinetic energy absorbed in the first set of moving blades, per pound of steam is

$$E_1 = 15,635 \text{ foot-pounds per second.}$$

In the second set of moving blades the energy is

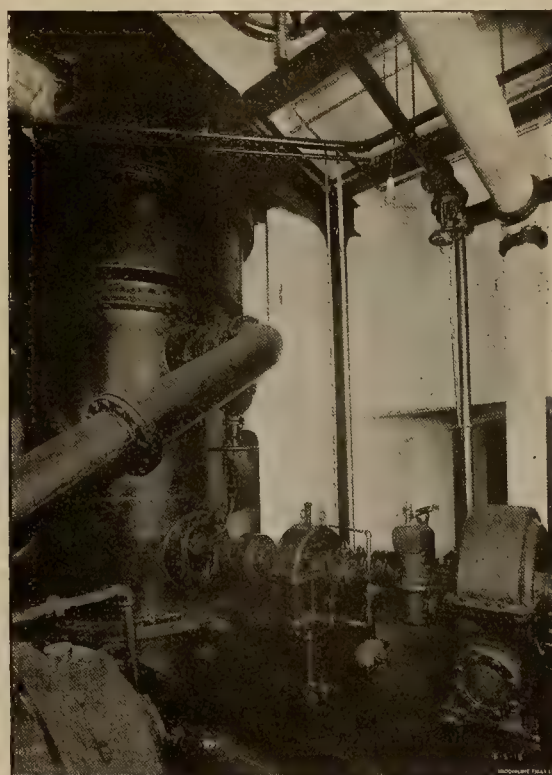
$$E_2 = 13,400 \text{ foot-pounds per second.}$$

The total energy converted into useful work in the first stage, per pound of steam is

$$15,635 \text{ plus } 13,400 = 29,035 \text{ foot-pounds per second.}$$

If the entire heat drop had been utilized in doing work, leaving the steam with zero velocity, the total energy would be

$$\frac{(1456)^2}{64.4} = 32,920 \text{ foot-pounds per second.}$$



Allis-Chalmers 90-hp., 3600 r.p.m. impulse turbine at right driving 860 r.p.m., 20-inch double runner discharge pump for high vacuum jet condenser through Falk reduction gears. Condensing equipment operates in conjunction with a 4000-kw. steam turbine.

The difference between this figure and the 29,035 foot pounds per second, actually transformed into work, is 3,885 and it represents the loss due to the residual velocity of the steam leaving the second row



of buckets. Since the steam is brought to rest before entering the second set of nozzles, this energy is lost.

$$\text{The heat equivalent of this energy is } \frac{3,885}{778} =$$

5.0 B.t.u., which increases the final heat content of the steam passing on to the second stage, as follows:

$$1270.5 - 42.3 + 5.0 = 1233.2 \text{ B.t.u.}$$

The remaining stages each have one set of moving blades and may be analyzed in a similar manner.

Neglecting the energy remaining in the exhaust steam, the total heat drop of 380.5 B.t.u. per pound is available for doing useful work. The water rate of the ideal turbine would be

$$\frac{2456}{380.5} = 6.7 \text{ pounds per horsepower hour.}$$

The heat consumption per horsepower per minute

$$= \frac{6.7 (1270.5 - 890)}{60} = 42.2 \text{ B.t.u.}$$

The thermal efficiency

$$E_t = \frac{1270.5 - 890}{1270.5 - 59.7} = 0.314$$

Under the above conditions a Curtis turbine would actually have a water rate of about ten pounds per horsepower hour.

The thermal efficiency would be

$$E_t = \frac{2546}{10 (1270.5 - 59.7)} = 0.21,$$

$$0.314$$

$$\text{and the Rankine cycle ratio} = \frac{0.314}{0.21} = 0.669.$$



100-hp. Terry impulse turbine at the Lake Union Steam Electric Station, City of Seattle, driving 400-gal. per. min. boiler feed pump.

## THE PROVINCE OF SALESMANSHIP

BY C. B. MERRICK

(The business of educating the public to familiarity with electricity is largely a problem of salesmanship. The broader aspect of salesmanship in its relation to electrical development is the subject of the following discussion.—The Editor.)

The chief obstacle to the universal adoption of the method electrical is unfamiliarity. More than any other modern convenience electricity is a mystery to the public, and what the public does not understand it distrusts or neglects. Electrical development is only bounded by the ability of its promoters to convince the public, and in proportion as the public is educated, so will the use of electricity increase.

### Whose Business Is It? —

The accomplishment of their education is the primary work of salesmanship. Salesmanship in its broadest sense means a good deal more than merely effecting the exchange of a certain article or commodity for a given sum of money. Salesmanship is the link between those who know and those who do not know; it is the art of getting the other man's viewpoint, realizing his needs, and supplying them in a way that is honestly beneficial to him. A sale which benefits only the seller is no sale in the long run.

The public judges the company, and even the company's products, largely by the salesmen, and each employe is personally responsible for the public's estimate of his company.

### Inside and Outside Salesmanship —

But the field of salesmanship does not end here. It embraces every department of every organization, and whether you are connected with the sales force or not, you come in contact with salesmanship every day and use it. There is a story of an Alabama dandy (he must have been an Irishman in a previous life) who took part in a debate on the subject, "Which is of greater importance to the world—the sun or the moon?" Explaining how he won the debate, he said, "Ah jus' done sayd dat dah moon was mos' impo'tant 'cause the sun he shine in de daytime when we don' need no light, and de moon he shine at night when we sho' do need it; an' they wan't nobody could argy roun' it."

The interdependence between the different departments of an organization is based on the principles of salesmanship. The office boy sells his services to the firm and holds his position just so long as he fills the needs of the office. The general manager planning improvements and extensions sells these ideas to the president by proving their necessity and advantages. Together they sell the idea to the banker, and through him to the bond-buying public. In each transaction there is or should be mutual benefit involved; and each transaction is definitely based upon salesmanship.

Since salesmanship is so all-important a factor both within a business and without, it is necessary for every employe to regard himself as a salesman in the broadest sense of the word. Only in this way can the message of the electrical industry be adequately conveyed to the public.



# Planetary Attraction and the Helium Atom

BY DR. A. C. CREHORE

(The substances composing the sun, the planets and other heavenly bodies are seemingly made up of mixed kinds of solid matter that offer interesting comparisons under the analysis of Dr. Crehore's new theory of mass and attraction. A star composed of helium is herein discussed and conclusions drawn. This is the ninth paper appearing in the columns of the Journal of Electricity by this noted author on the subject of The New Physics.—The Editor.)

In the preceding example, by which the average speed of an electron in the earth was found, the mass of the earth in grams was used as a factor both in getting the total  $\Sigma_e \beta^2$  and in getting the total number of electrons in the earth. Upon division to obtain an average the mass cancelled out. In other words it was really not required at all, and no error introduced through an incorrect numerical value of the mass of the earth could affect the final result in any way. From this it is apparent that the result above obtained for the earth is very general, and applies to the planets and sun or any other form of matter just as well.

## Mass and Attraction

Let us consider two representative cases. First, apply the gravitational equation to find the attraction between a star, or large mass of nebulous gas composed entirely of hydrogen and nothing else, and a single hydrogen atom situated outside of the star at some distance,  $r$ , from its center of gravity. Denoting the mass of the star by  $M$ , Newton's law gives the average attraction as

$$F = k' m_H M r^{-2}.$$

According to the general expression for mass in terms of the sums of the squares of the speeds of all the electrons within the mass above deduced, we have for the star

$$M = \frac{e^2 m_0}{h} \Sigma_M \beta^2$$

and for the hydrogen atom

$$m_H = \frac{e^2 m_0}{h} \Sigma_H \beta^2$$

whence by division

$$M/m_H = \Sigma_M \beta^2 / \Sigma_H \beta^2.$$

But, for the hydrogen atom having two electrons, the sum of beta square is twice beta square for a single electron, which may be denoted by  $\beta_H$ . Hence,

$$M/m_H = \Sigma_M \beta^2 / 2\beta_H^2.$$

And, solving for  $\beta_H^2$ , the preceding proportion is the same as

$$\beta_H^2 = \frac{\Sigma_M \beta^2}{2} \cdot \frac{1}{M/m_H}$$

In this form, since the star is by hypothesis composed entirely of hydrogen, the actual speed of an electron and the average speed are the same thing, all speeds being alike. Hence the equation really says that the average square of the speed is equal to the sum of the squares of the speeds of all the electrons in the star divided by  $2M/m_H$ . The average square of the speed must, however, be equal to the total sum of the squares of all the speeds

divided by the number of electrons in the star. It follows that the denominator of the last expression must be the total number of electrons in the star. This is evident directly, for the mass of one gram divided by the mass of the hydrogen atom must equal the number of atoms in a gram, namely  $1/m_H$ . Since there are two electrons per atom in hydrogen, the number of electrons per gram is twice the number of atoms, namely  $2m/m_H$ . Since  $M$  denotes the number of grams in the star, evidently  $2M/m_H$  must be the total number of electrons in the hydrogen star.

Now the number  $1/m_H = 1/1.658 \times 10^{-24}$  is very nearly equal to the well-known Avogadro constant. Hence the number of electrons per gram of hydrogen according to the result is about twice the Avogadro constant.

The next representative case to be considered is that of a helium star attracting, say, a single helium atom at a great distance,  $r$ , from the star. We have a similar proportion to the above, namely

$$M/m_{He} = \Sigma_M \beta^2 / \Sigma_{He} \beta^2,$$

where the symbol ( $H_e$ ) refers to the helium atom. According to the atomic weight table above given, the helium atom consists of a single ring of four electrons. Denoting the speed of one electron by  $\beta_{He}$ , the sum of the squares for one atom is

$$\Sigma_{He} \beta^2 = 4 \beta_{He}^2,$$

and the above proportion may be written

$$\beta_{He}^2 = \frac{\Sigma_M \beta^2}{4} \cdot \frac{1}{M/m_{He}}$$

In a similar manner to the case of the hydrogen star, the mean square velocity for the star must be the same as the square of the velocity of a single electron in the helium atom,  $\beta_{He}$ . Since the numerator represents the total sum of the squares of the speeds, it follows that the denominator must represent the total number of electrons in the star. And, evidently,  $1/m_{He}$  is the number of helium atoms in one gram, and  $4/m_{He}$  is the number of electrons in a gram of helium, and  $4M/m_{He}$  must be the total number of electrons in  $M$  grams of helium, that is in the star.

Now, the mass of the helium atom compared with that of hydrogen is as the numbers 4.00 to 1.008. Hence,  $4/m_{He} = 1.008/m_H$ . Using the Millikan value of  $m_H = 1.662 \times 10^{-24}$ , we obtain

$$4/m_{He} = 6.065 \times 10^{23} = \text{No. electrons per gram of He.}$$

This number is very close to the well-known Avogadro constant, which is given by Millikan as  $6.062 \times 10^{23}$ . In deriving his value Millikan used a value of the atomic weight of hydrogen 1.0077,



which he supposes is more accurate than 1.008. This will account for the difference in the last decimal place of the Avogadro constant.

These two examples have been chosen because the helium star, being based upon an atom with a ring of four electrons, is typical of all the other kinds of atoms, that is, of any mixed mass of matter, while the hydrogen star forms an exception to the rule, as it does in other particulars.

#### Planetary Attraction and the Helium Atom

Let us next consider an example of a planet, made up of any mixed kinds of solid matter, say, and compare the attraction of the planet for a distant helium atom with that of the helium star just considered for the same helium atom at the same distance. Let us also suppose that the masses of the planet and of the helium star are the same, each equal to  $M$ . Denote by  $A$  the Avogadro constant. As above, we have for the helium star

$$\beta_{He}^2 = \frac{\Sigma_M \beta^2}{A M},$$

And, for the planet we have

$$\bar{\beta}^2 = \frac{\Sigma_M \beta^2}{x M}.$$

Here  $\bar{\beta}^2$  is the average mean square of the speeds of all the electrons in the planet, and we have used  $x$  for the number of electrons per gram. Since we know that the masses of any two bodies are strictly proportional to the sums of the squares of the speeds of the electrons they contain, and since we have taken the mass of the helium star equal to that of the planet, it follows that the numerators above are equal. When we divide the one expression by the other, these sums of squares of the velocities cancel out as well as the masses, and we have the simple relation

$$\frac{\beta_{He}^2}{\bar{\beta}^2} = \frac{x}{A} \text{ or } \bar{\beta}^2 = \frac{A}{x} \beta_{He}^2.$$

Now, it is well known that the number of electrons per gram,  $x$ , of any substance except hydrogen is approximately constant. This may easily be proved on either of the two suppositions that the number of electrons per atom are nearly proportional to the atomic number or to the atomic weight, it does not matter which, since the atomic weight is roughly twice the atomic number. Hence  $x$  is a constant number for any kind of mixed piece of matter like the planet we are considering. Moreover, it is believed that this number is very nearly equal to the Avogadro constant. If we make it equal to this constant, then the  $x$  and  $A$  cancel out above, leaving

$$\bar{\beta}^2 = \beta_{He}^2 \text{ or } \bar{\beta} = \beta_{He}.$$

That is to say, the average speed of an electron in the planet is very nearly the same as the speed of an electron in the helium atom, and this is the same as the speed in a ring of four electrons.

#### Atomic Weight Scheme

This is, therefore, the reason why the average speed in the earth in the previous example came out the same as the speed in a ring of four electrons very nearly. The result is, therefore, general as applying to any planet, and the fact that it is so is intimately connected with the scheme given in the atomic weight table above, which makes the number of rings of four electrons greatly in excess of any other kind of ring. This arrangement may also be regarded as the reason why the number of electrons per gram is very nearly constant for all substances except hydrogen. These considerations seem to establish in a fairly satisfactory manner the scheme of the atomic weight table in this one particular at least, namely, indicating that rings of four electrons greatly preponderate in the atoms of different elements.



An artificial reservoir in the mountains of Montana, the property of the Mission Range Power Company of that state. The power house installation consists of two 350-hp. tangential water wheels connected to two 200-kva. generators. Electricity is transmitted to Polson where it is distributed to consumers in the town. Midway between the power house and Polson the line is tapped by the Flathead Valley Electric Company which purchases power wholesale from the Mission Range Power Company and retails it for lighting and power in the towns of Ronan and Pablo.



## SPARKS—Current Facts, Figures and Fancy

(On this page a description of the most remarkably beautiful telephone in the world stands alongside of an announcement of the latest discovery in steel manufacture. Fascinating subjects such as an underground bakery, cities-made-to-order, the latest and most adventurous field for American engineers, an electrically operated device for the prevention of train wrecks, and the discovery of remarkable coal fields in Utah are also presented.—The Editor.)

The scarcity of coal is not proving of as great moment as one might have thought a year or two ago. A decided tendency is noticeable in Great Britain to substitute oil fuel for coal wherever possible. Shipping companies, and even railroads, are making or planning extensive conversions of equipment, so that this kind of fuel can be used.

\* \* \*

A scientist of Norway has discovered a way of using the great quantities of white, marble-like rock abundant in the southwest part of that country. Thus by the use of nitric acid and the process of evaporation aluminum is obtained. The process may materially increase the supply of this metal, and most surely seems full of promise for that country.

\* \* \*

Cities made-to-order are taking their logical place in our "ready-to-wear" civilization. City planners, architects and sociologists were allowed, during times of war time production emergency, to let their imaginations run riot, resulting in thirty-five custom-made Utopias, valued in the neighborhood of \$55,000,000, which are soon to be placed on the market.

\* \* \*

To find coal in solid formation on the very surface of the earth is indeed an encouraging discovery. This very condition is reported true in the southern part of Utah. It is estimated that there is probably over a billion tons of workable cannel coal in this region. The only thing preventing immediate profitable development, according to a prominent geologist, is the lack of transportation facilities.

\* \* \*

The most remarkable telephone in the world is said to be that possessed by the Queen of Spain. This luxury of luxuries is of solid silver with a gold transmitter, and is supported by four bronze figures, among which a boy leaning against a Spanish coat-of-arms is conversing by telephone—a golden wire—with an English girl in close proximity to a British lion. This work of art stands on her majesty's writing table, and connects with the royal nursery only.

\* \* \*

The newest and most adventurous field for American engineers is said to be the far-off land of Rumania. All reports indicate that there are tremendous fields for engineering achievement and financial profit there. Bridges must be built, harbors extended and canals cut. An idea of old Rumania's potential hydraulic power can be gained from the fact that an average of 32,268,521,000 cubic meters of water flow into the Danube yearly, or 1,023.23

cubic meters per second. An employment of thirty-five per cent of this volume of water would furnish 500,000 horsepower in average years.

\* \* \*

Tungsten may have to take a back seat as the world's hardest steel. Announcement comes from London that Molybdenum, the newest invention in steel, is far in advance of any high-speed steel hitherto made. Its discoverer claims that the new steel has far more commercial possibilities than any now in use, that it is unrivaled in hardness, that in tool form it will remove a greater weight than any other steel, and that it possesses comparatively longer life than any other.

\* \* \*

It is rumored that within this year wireless telephones will replace the present system with great economic advantage. With China, the most backward nation, daily using the wireless telephone for communication between cities and the rural districts, we certainly can look for rapid advances in this country. This type of communication has a particular advantage in that it involves no line upkeep and in that service is not subject to interruptions due to atmospheric causes.

\* \* \*

We may hope for the last of train wrecks when a certain late invention in railway engineering is established. This is an automatic, electrically-operated device, fashioned somewhat after the working of the automatic electric block signal system. Any obstruction on the track or any condition of the rails that breaks the circuit automatically shuts off the steam and applies the air brakes in the locomotive in time to bring the train to a complete stop a considerable distance from the danger point.

\* \* \*

An underground bakery furnishes all the bread used by the refugee population in the ruined city of Verdun. No other building was sufficiently undamaged to house a bread-baking establishment for the returning townspeople, so the great "subway" ovens are daily turning out long, crisp loaves which compose the principal food of those toiling among the ruins. Several times each day the bread is brought to the mouth of the black cavern beneath the great walls, where lines of people await their rations. The bakeshop is a part of the famous underground city of Verdun, built after the war of 1871 and designed to house 30,000 persons during an attack. During the Great War, thousands of soldiers and a few refugees lived in this subterranean abode while the city was under fire for nearly five years. The bakery was in operation during the whole time.



## PERSONALS

W. B. Greeley, assistant forester, has been appointed head of the Forest Service of the United States, to become effective May 1st, 1920. Mr. Greeley has long been considered an eminent man in forestry matters. Born in California, he received his early education here, graduating from the University of California with the class of 1901. Since that time he trained at the Yale Forestry School, and has served in various forestry districts throughout the West, having charge for a number of years of Forest District No. 1 with headquar-



ters in Missoula, Montana, the largest district of the six districts in America. The West views with unusual interest the appointment of Mr. Greeley to his new position. It is believed that his intimate knowledge of affairs electrical in the West, and the vast possibilities of hydroelectric development now existent in the nation, will make possible new and helpful policies in the Forestry Service looking toward the development of our country.

M. Uchisaka, illuminating engineer for the Tokyo Electric Co., Ltd., of Tokyo, Japan, is a recent San Francisco visitor.

Mortimer Fleishhacker, president of the Great Western Power Company, is spending some time in the East on a business trip.

G. F. Kirkpatrick, Pacific States Electric Company salesman, Seattle, was called East recently by the death of his mother.

D. W. Pontius, manager of the Pacific Electric Railway Company of San Diego, was in San Francisco lately on a business trip.

C. G. A. Baker, vice-president and general manager of Baker-Joslyn Company, San Francisco, spent two weeks recently in Seattle.

H. H. Manny, manager Seattle office of Baker-Joslyn Company, pole, line and construction material, is spending some time in San Francisco.

M. C. Osborn, formerly head of the commercial department of the Washington Water Power Company, is now range specialist for Landers, Frary & Clark, with headquarters in New Britain, Conn.

C. R. Manville, vice-president of the H. W. Johns-Manville Company, Milwaukee, is making a tour of the Pacific Coast and was in San Francisco for several days.

Frank J. Wachter, vice-president, and William C. Sears, sales manager of the motor appliance department of Landers, Frary & Clark, are making a tour of Western cities.

R. R. Barlett, chief engineer of the Port of Astoria, left recently on a four or five weeks' trip to Chicago, New York, Boston, Philadelphia and Baltimore to investigate the various types of cargo handling equipment and also to confer with officials of the shipping board.

Edwin A. Rogers has resigned his position as chief engineer in charge of the Cornelia Copper Company's power plant at Ajo, Arizona, and will come to San Francisco in April to engage in consulting engineering, specializing in fuel oil combustion and power plant efficiency work.

W. D. Ward is announced as the manager of the Atlantic Department of the Pelton Water Wheel Company. Mr.

Ward has been associated with the Pelton Water Wheel Company for more than twenty-five years, having been the ranking sales engineer in the home office previous to his assumption of the post in New York.

J. J. Crowe, formerly sales manager of the Intermountain Electric Company, has tendered his resignation to become general manager of the Utah Electric & Motor Equipment Company of Salt Lake City. The latter company is a reorganization of the firm of Eardley Brothers, and conducts a retail electric and automobile accessories and service business.

Ake Alin, assistant engineer of the Royal Swedish Board of Waterfalls and the representative of the Swedish government to examine large dams and the utilization of water power in the United States, is a recent San Francisco visitor. Mr. Alin is particularly interested in the large hydroelectric projects in the West and will probably visit the Hetch-Hetchy before his return, as the Swedish government is contemplating extensive construction of large dams for the development of power in the extreme northern part of Sweden.

C. C. Campbell, for some time past local manager of the Mountain States Telephone & Telegraph Company at Salt Lake City, has severed his connection with that company to become sales manager of the Intermountain Electric Company, a prominent jobbing house of both electrical supplies and auto accessories, with headquarters in the same city. Mr. Campbell served with the telephone company for sixteen years in various capacities. He will be succeeded as manager of the telephone company by F. W. Carroll, formerly their manager at Ogden, Utah.

William S. Turner, consulting civil and electrical engineer of Portland, Oregon, recently returned from a trip of several weeks' duration in the East. New York and other eastern cities were visited. The trip was taken in connection with valuation reports for eastern financiers interested in various properties on the Pacific Coast. Mr. Turner is also endeavoring to obtain the assistance of New York capital in developing a large hydroelectric project in which he and others are interested. He discussed with various financial people the general situation regarding development of water power on the Pacific Coast. Some study was also made of the electric railway situation in different cities as regards rates, franchise matters and competition of motor bus lines.

George L. Myers, who has recently been appointed assistant to the president of the Portland Gas & Coke, Pacific

Power & Light, and Walla Walla Valley Railway companies, is among the most active workers in electrical affairs of the Northwest. He came to Oregon in 1907, and previous to his association with the companies mentioned above, was in the employ of the Oregon-Washington Railroad & Navigation Company. In 1912 he became assistant treasurer of the Pacific Power & Light Company and private secretary to the



president of the three associated companies. He has been active for some time in the affairs of the Northwest Electric Light & Power Association, and at the annual convention in Seattle last September was elected vice-president and member of the executive committee. He is also a member of the public policy committee of the association and chairman of the public policy committee for Oregon. His new position involves important executive duties, for which his successful and energetic association work stamp him as exceptionally well qualified.



**C. E. Magnusson**, professor of electrical engineering and acting dean of the College of Engineering at the University of Washington, has been nominated as a vice-president of the American Institute of Electrical Engineers. Professor Magnusson has long been an active factor in affairs electrical in the West. After getting his doctor's degree from the University of Wisconsin, he trained under Dr. Steinmetz of the General Electric Company in Schenectady. Coming West, he was for a period in the physics department of the University



of New Mexico, and since 1904 has been head of the electrical engineering department of the University of Washington, where he has become a leader in electrical thought in the Northwest. Robert Sibley, editor of the Journal of Electricity, who was also proposed as a candidate for the A. I. E. E. office, resigned in favor of Professor Magnusson.

**L. R. Cady**, general manager of the Lassen Electric Company, was among recent visitors to San Francisco.

**H. H. Jones**, general manager of the San Diego Consolidated Light and Power Company, is a recent San Francisco visitor.

**Harry Noack**, of the Pacific States Electric Company, San Francisco, passed through Seattle recently on his way home after a trip through the East.

**J. J. Estabrook**, who for the past three years has been Western manager of the Standard Electric Time Company, with headquarters in Chicago, is now located in San Francisco.

**Bruce Lloyd**, manager of the engineering department with Henry Lund & Company, San Francisco, left on March 26th for a visit to New Zealand. He will be away three or four months.

**Franklin T. Griffith**, president of the Portland Railway Light & Power Company, **Guy Talbot**, president of the Pacific Power & Light Company, and **D. L. Huntington**, president of the Washington Water Power Company, are recent San Francisco visitors.

**A. A. Brown**, assistant to the vice-president, and **Frederick Darlington**, consulting engineer of the Westinghouse Electric & Manufacturing Company, were in San Francisco for a brief visit lately. They are making a tour of inspection over the Western plants of the company.

**Magnus T. Crawford**, electrical engineer for the Puget Sound Traction Light & Power Company, passed through San Francisco recently on his way back to Seattle. Mr. Crawford has been making an extended trip throughout the United States looking into underground distribution systems.

**Reinier Beeuwkes**, chief electrical engineer of the Chicago, Milwaukee and St. Paul Railroad with headquarters at Seattle, has completed a wonderful piece of engineering in the electrification of the lines of the Chicago, Milwaukee and St. Paul, running east of Seattle. With the exception of one small gap the line is now completely electrically operated from Harlowton, east of the Rockies, to Seattle (Renton), west of the Cascades. Mr. Beeuwkes gained his knowledge of railway electrification in the work on the Cascade tunnel of the Great Northern Railway and as assistant to Mr. C. T. Hutchinson, who was consulting engineer for the Great Northern. Mr. Beeuwkes has been engaged in the electrification of the Chicago, Milwaukee and St. Paul ever since the start of the project and a great deal of the credit for the success of the achievement should go to him as he has overcome the numerous difficulties attendant upon such big undertakings in a way which has greatly advanced that branch of the industry.

**J. T. Smoot**, former petroleum chemist, U. S. Bureau of Mines, is spending a few days in San Francisco. Mr. Smoot is visiting California for the purpose of making a study of the state's oil conditions.

**Lieut.-Colonel Wm. Kelly** has recently come west to take charge of the Third San Francisco engineering district, succeeding L. H. Rand. Lieut.-Col. Kelly served for two years in France during the war, and later with the Peace Commission. His new offices will be at 240 Montgomery street, San Francisco.

**J. C. Hoyt**, chief of the division of Water Resources of the U. S. Geological Survey, was in San Francisco recently en route to Honolulu where he is going on official business. During his visit Mr. Hoyt was entertained by a group of San Francisco civil engineers at an informal luncheon at the Engineers' Club.

**L. F. Harza**, chief engineer for James O. Heyworth, has entered private practice as a consulting hydroelectric engineer with headquarters in Chicago. Mr. Harza, it will be recalled, was the author of an extensive survey of the Columbia river power developments which appeared in the columns of the Journal of Electricity in 1915.

**A. Emory Wishon**, assistant general manager of the San Joaquin Light & Power Corporation and president Pacific Coast Section N. E. L. A., has left for New York City. A number of prominent meetings have been arranged by James H. McGraw, president of the McGraw-Hill Company, for the delivery of Mr. Wishon's Self-Interest Story, which has proven in recent months to be one of the most helpful activities of the current year and has received national recognition from all sides. Mr. Wishon expects to return to California May 1st. His address will be given before prominent publishers, advertising men and financiers of the East.

**Henry H. Buell**, who has been electrical engineer with the Pacific Gas & Electric Company in the San Jose district

for the past eight years, has accepted a position with the Bureau of Standards at Washington, D. C. Mr. Buell is a graduate of Stanford University, and previous to his connection with the Pacific Gas & Electric Company was associated with the East Pittsburgh factory of the Westinghouse Company, later serving as a hydraulic engineer for the Panama Canal Commission. His new appointment comes to him as a

result of his marked technical ability, and his capable work in previous positions. He carries with him the best wishes of his Western friends and associates.



## OBITUARY

**Richard Ruddell**, president of the Globe Stove and Range Company of Kokomo, Indiana, passed away recently.

**Melvin B. Newcomb**, aged thirty-one years, chief engineer of the rubber machinery department of the Wellman-Seaver-Morgan Company, died on Sunday, March 13th, after a short illness at his home, 742 West Avenue, Akron, Ohio.

**John A. Randolph**, of the Westinghouse Electric & Manufacturing Company, died a short time ago in Wilkesburg, Pennsylvania. Mr. Randolph graduated from Syracuse University, Syracuse, N. Y., with the class of 1903. After graduating, he engaged in engineering and writing technical literature for trade magazines, to which work his education and experience permitted him to do full justice. Mr. Randolph was also engaged for a time in the activities of the Society for Electrical Development, located in New York.



## Meeting Notices for Electrical Men

(A significant meeting of the Engineers' Hoover Republican Club; the Stockton meeting of the California Electrical Contractor-Dealers' Association, and a number of important engineers and contractor-dealer meetings held in the Northwest are reported in the following pages. The account given of the recent meeting of the San Francisco Electrical Development League is of especial interest.—The Editor.)

### California Association of Electrical Contractors and Dealers

At the monthly meeting of the California Electrical Contractor-Dealers' Association held at Stockton, March 12, 118 were present of whom only 50 were actually contractor-dealers, showing that the other branches of the industry are beginning to realize the necessity of keeping posted on what is being done in all branches of the industry. The morning was taken up with the executive session and in the afternoon two important discussions were held. A code of ethics or practice was drawn up, discussed, and adopted unanimously, and there was lively discussion on the advisability of forming three divisions, or sections of the association, the three fields to be, motors, contractors, and dealers.

Twenty-five new members were admitted to the association and a new section was added, that of Kern county. The State Fair Commissioners suggested that there be an electrical exhibit at the next State Fair and have offered to put up a special building as an inducement to such an exhibit. No action was taken on this matter, but President Chamblin has appointed a committee to look into it.

In the evening Mr. Robert Sibley, editor of the Journal of Electricity, gave a real live talk on "The Status of the Electrical Industry in the West and Its Future Possibilities." Mr. A. Emory Wishon, president of the Pacific Coast Section, N. E. L. A., followed Mr. Sibley and pointed out that the spirit of the pioneers who braved the trackless waste of the desert and the difficulties and dangers of crossing the Rockies, still lives in the people of the West. For the vision of the West, its industry and invention, its resources and its climate, are all bringing another kind of a caravan from the East than that in which our forebears came. Mr. Wishon further pointed out that the West cannot develop ahead of its hydroelectric resources, all branches of industry depending on cheap electric power; that the development of our resources will take finances and that at the N. E. L. A. Convention at Pasadena, in May, the bond men, bankers, power managers, manufacturers, jobbers and dealers from the East will be here, and it is up to the West to give them "A Western welcome and a chance to see what Western vision, determination and faith can accomplish, and what we have before us for accomplishment in the future."

### Northwestern Contractors and Dealers Meet

The regular meeting of the First District, Oregon Association of Electrical Contractors and Dealers, was held a short time ago at the Chamber of Commerce, Portland, Ore. The following firms were represented:

J. F. Barrett, F. A. Bauman Electric Co., Jaggar-Sroufe Co., E. L. Knight Co., NePage-McKenny Co., L. M. Oliver, Pierce-Tomlinson Electric Co., Portland Electrical Maintenance Co., R. R. Poppleton, Scott Electric Co., Vanderlip & Lord, Western Electric Works.

Mr. Kenny, chairman of the Special Contractors' Policy Committee, reported that his committee did not find a lack of the spirit of cooperation, but found an indifference to the matter of reasonable profit, methods of determining costs and the true condition of the business in a great many cases. His report urged the individual member to give more attention to the matter of costs and recommended the adoption of a standard system of cost accounting by all the members, calling attention to the fact that his committee will be powerless to make any further progress until such time as all the members place their business on a firm basis.

Mr. J. F. Barrett gave a very interesting and instructive talk on his observations of conditions in the industry in San Francisco, gathered during his recent visit to that city, and forcibly brought to the attention of those present the great need of closer harmony and cooperation and the results to be looked for from the same.

Mr. Tomlinson also addressed the meeting, on the Northwest Cooperative Campaign. He explained how the movement was started, what its mission is, and read the report of its first Advisory Committee meeting.

The secretary urged that the "Suggestions by Members," an order of business which is usually overlooked, be more freely used, calling attention to the fact that members are too prone to be backward in submitting ideas occurring to them for the betterment of conditions,

which if brought out and discussed, might develop in importance. He also urged all members to give more attention to the different trade journals and suggested that those who could not find time through the day to read them have them sent to their homes. He went on to emphasize that many of the important ideas found in them could be put into effect with great profit.

### Meeting of Engineers' Hoover Republican Club

At a meeting of the Hoover Republican Club of San Francisco Engineers it was decided that a letter and enrollment card should be sent to all engineers on the mailing lists of the various local branches of the engineering societies. The letter states the reasons why Hoover should be the next President, and instructs all of the engineers interested to register as Republicans and to register before April 3rd. The enrollment card is a pledge to work for the election of delegates to the Republican Convention, who will cast their votes for Hoover as Republican candidate for President of the United States.

### BUILDERS OF THE WEST — LXXIV



REINIER BEEUWKES

Since the time when the "Rocket" pulled its first load of freight and passengers, no greater advances have been accomplished in railroad engineering than the conquest of the Rocky and Cascade mountains by electric locomotives, culminating in the triumph of March 5, 1920. Long after the coal and oil supply of the country is exhausted, the hydroelectric plants will be furnishing the power necessary for the transportation of supplies to and from the East. To Reinier Beeuwkes, electrical engineer of Seattle, this issue of the Journal of Electricity is affectionately dedicated, in recognition of his vital share in electrifying the Chicago, Milwaukee & St. Paul Railroad over the continental divide, an achievement in which once more the West leads the way, blazing the trail for others to follow.



Three thousand of these letters will be sent out, and to every favorable answer received ten pledge cards will be sent which will be distributed, signed and returned. By this plan the engineers believe they will be doing their bit to elect an engineer, whom they believe to be the best available man, to the White House.

#### Seattle Section, A. I. E. E.

Seattle Section of the American Institute of Electrical Engineers met at the Arctic Club assembly room on March 16, 1920, with forty members and five visitors present. Chairman Quinan announced the appointment of the following men on the membership committee: P. B. Munson, E. J. Des Camp, G. H. Smith, E. H. Marriott, D. C. Barnes. Mr. Terrell, chairman of the papers committee, announced that the April meeting would be a city light meeting with three short papers. F. R. Nicholson, locating engineer, will present some new features in connection with the Cedar Falls pipe line. W. J. McKeen will discuss some new features of power house design which are being inaugurated at Cedar Falls. G. H. Smith will give a paper on the new type of distribution system which the City Lighting Department is putting in operation at this time. The trip to Cedar Falls will be conducted on Saturday, May 1st, when it is planned to visit the Milwaukee substation, observe an electric locomotive and also visit the generating station of the lighting department. The New York office has defined the territory of the section as extending in a 60-mile radius around Seattle. The section feels that it is entitled to more territory and suggests that the jurisdiction extend half-way to Spokane, Portland, and Vancouver, B. C. A motion was made and carried that the executive committee be instructed to take up the matter with the New York office.

Thomas E. Phipps, formerly chief engineer for the Public Service Commission of the state of Washington, presented a timely and interesting paper on Elements for Consideration in Valuations.

#### Commercial Section Committee Organized

The Governing Committee of the Commercial Section of the Northwest Electric Light & Power Association held its first meeting a short time ago in Seattle. A plan of work for this committee was outlined and it was suggested that the commercial efforts of every central station member of the organization could well be devoted in an effort to profit by the past few years' experience of every member of the company. It was further suggested that the future thought of this committee be directed especially towards means of conserving company resources and increasing efficiency.

#### A. I. E. E. Membership, San Francisco

Following are the names of those composing the membership committee of the San Francisco section, A. I. E. E., from whom may be obtained application blanks and booklets which describe the Institute and its activities:

Ralph S. Twogood, engineering department, Southern Pacific Co., San Francisco.  
 F. C. Piatt, Pacific Gas & Electric Co., San Francisco.  
 H. P. Bell, Key System Bldg., Oakland, Cal.  
 Adrian L. Anderson, Federal Telegraph Co., Palo Alto, Cal.  
 E. Bachman, General Electric Co., San Francisco.  
 L. N. Robinson, Stone and Webster, San Francisco.  
 H. S. Lane, Pacific Gas & Electric Co., San Jose, Cal.  
 Gaskell S. Jacobs, Railroad Commission, State of California, San Francisco.  
 G. L. Scoville, The Pacific Tel. & Tel. Co., San Francisco.  
 E. V. Calderwood, The Pacific Tel. & Tel. Co., San Francisco.  
 C. A. Turner, The Pacific Tel. & Tel. Co., San Francisco.

Although these engineers compose the membership committee, each member having the Institute's activities and progress at heart is invited to consider himself a member of this committee and lend his efforts accordingly. The chairman of the membership committee will gladly add the name of any member who may volunteer in this work.

#### San Francisco Electrical Development League

The March 15th meeting of the San Francisco Electrical Development League was presided over by Mr. S. V. Lisberger, who as chairman of the day spoke of load conditions in the East, remarking upon the fact that there have been several severe burn-outs in the large cities of the East, crippling whole sections for several hours at a time, due to the heavy over-loading of all lines. The increase in the load has been phenomenal and shows an increase of 25% where practically no increase was expected—the Chicago Commonwealth Edison Company reaching its peak one afternoon with a load of 448,000-kw.

Mr. Lisberger then went ahead to tell of the committee which is now working on a new set of rules to embody the present "Electrical Utilization Safety Orders" issued by the Industrial Accident Commission of California, and the "National Electrical Code" as recommended by the National Fire Protective Association.

The committee, of which Mr. Lisberger is the chairman, was carefully selected and men who were thoroughly familiar with the practical and theoretical side of the subject they were to formulate.

Mr. Carl E. Hardy, city electrician of Oakland, next spoke on the policy of the committee, explaining and amplifying the formal resolution as adopted by the committee. The resolution as adopted reads as follows:

Whereas, It is highly desirable to provide a single set of rules and requirements embodying the present "Electrical Utilization Safety Orders" issued by the Industrial Accident Commission of the State of California, and the "National Electrical Code," as recommended by the National Fire Protection Association; and

Whereas, The continuation and recognition of existing national standards for fittings and material, as well as the methods of installation, is of the utmost importance; therefore be it

Resolved, That these principles are hereby adopted by this committee as its policy, and that all rules and requirements proposed by subcommittee comply with the following:

1st: That the present form of the "Code" and "Safety Orders" be disregarded and a new form adopted providing for the grouping of all rules relating to a subject under the title of that subject; also that the subject titles relate to the classification of the installation such as "service," "Motors," "Fixtures," etc., and not as to materials used.

2nd: That in order to permit cities, towns or other political subdivisions to require within the rules and requirements such higher grades of installations as determined shall provide minimum requirements and shall include recommendations for major requirements, thus permitting a selection within the rules in such instances.

3rd: That all rules be written in language clearly understood by an average electrical worker, be mandatory in form and explicit in requirement.

4th: That in the preparation of rules and regulations by subcommittees, there be a minimum deviation from present practice except such rules recommended by subcommittee and approved by general committee.

5th: That the specifications for fittings and material contained in Class "D" of the "National Electric Code" be unchanged and provision directly made for recognition of the labels issued by the Underwriters' Laboratories, both fire and accident with provision for condemnation of substandard and unsafe devices.

Mr. Arthur Kempton, Chief of Department of Electricity of San Francisco, in speaking for Mr. C. W. Mitchell, Electrical Engineer, Board of Fire Underwriters and a member of the National Electric Code Committee, told of some of the recommendations to be made in changing the National Electric Code this year, some of which were:—

All switches on motors to be enclosed and externally operated. Also all bare parts to be protected or covered. Poly-phase motors to be equipped with an overload trip on each phase. Fuses not to exceed 110% of capacity of motor as indicated on the motor name plate. Circuit breakers to be installed on all motors—time circuit breakers not to be over 110% of rated capacity of motors but if circuit breaker is of instantaneous type may be set at 140%. Switchboards of dead face type only, to be allowed in theatre installations. Increase allowed in size and number of conductors run in conduits. 50 volts limit for farm lighting units. Permit use of varnish cloth as insulation on wire not less than No. 6.

Approved stands or warning lights to be sold with flat-irons, sad-irons or any iron used on combustible material, to reduce the fire hazard.

Mention was made of the fact that several of the manufacturers were concerned lest the California Industrial Accident Commission set up a separate laboratory to make unusual requirements for their products, but it is the idea of the Industrial Accident Commission only to require the recognition of the labels issued by the Underwriters Laboratories, both fire and accident with provision for



condemnation of substandard and unsafe devices, as stated in the resolutions of the committee.

Section 1. Members of the Association shall regard themselves as being engaged in a business on which there is a well defined duty and obligation toward the public and themselves. The business demands that members use every honorable means to uphold the dignity and honor of this vocation, to exalt its standards and to extend its spirit of usefulness.

Section 2. Every member of this Association should be mindful of the public welfare and should participate in those movements for public betterment in which his special training and experience qualify him to act. He should not, even under his client's instruction, engage in or encourage any practices contrary to the Rules and Regulations Safeguarding Life and Property, for as he is not obliged to accept a given piece of work, he cannot, by urging that he has followed his client's instruction, escape the condemnation attaching to his act. Every member of this Association should support all public officials and others who have charge of enforcing safe regulations in the rightful performance of their duty. He should carefully comply with all the laws and regulations touching his vocation, and if any such appear to him unwise or unfair, he should endeavor to have them altered.

Section 3. It is unbusinesslike for a member of this Association to assist unqualified persons to evade or to lend himself in the evasion of any of the recognized rules and regulations governing electrical work.

Section 4. Members of this Association should expose without fear or favor, corrupt or dishonest conduct and practices of the members of their business, and it is their duty to bring to the attention of the proper authorities the existence of electrical conditions which are unsafe to life and property.

Section 5. Members of this Association owe a duty to the business, of refusing to furnish estimates to general contractors who do not regard bids as final and binding, upon which they are awarded general contracts.

Section 6. Members of this Association shall not falsely nor maliciously injure, directly or indirectly, the business reputation, prospects or business of a fellow member of this Association.

Section 7. Members of this Association shall not attempt to supplant a fellow member after definite steps have been taken toward the letting of a contract to him. Nor should they offer any interference in the carrying out of the said contract or commission to the end that loss or damage may result to the fellow member. Each member should realize that he is a business man and anxious to succeed, but that first he is an ethical man, and wishes no success that is not founded on the highest justice and morality.

Section 8. When called to figure work on a job in which there is a doubt whether or not the original contract is finished, do as you would like to be done by and call up your fellow members and see what the conditions are.

Section 9. Attend the weekly meeting with the same faithfulness that you put into your business, remembering that the officers and those who do attend regularly are doing so for your benefit as well as theirs, and as our Association is strictly to educate its members in business methods, you are not only injuring yourself but the entire trade by not availing yourself of all opportunities for education afforded by our organization.

Section 10. Always remember that confidence begets confidence.

#### Oregon Chapter, American Association of Engineers

The regular meeting of the Oregon Chapter, American Association of Engineers, was held at 8:15 p.m. Friday evening, March 12th, at the club rooms, Tilford Building, Portland. After much discussion it was decided to support one or more engineers, should any be candidates for election, to the next legislature, because a large part of the money spent by the legislature is for engineering work. With the big road-building program, the control of the waters of the state and the proposed increase in size of the state college and university before it, the next session of the legislature will need engineers and architects on the floor of the house, argued the association members.

The following committee has been appointed to make a report on the educational mileage tax, and to visit the Oregon Agricultural College and survey the needs of the engineering departments, reporting back to the society their findings: Fred D. Weber, chairman, O. Lauregaard, E. W. Lazell, D. C. Henny, and F. S. Baillie.

#### A. S. M. E., San Francisco

The meeting of the San Francisco branch of the American Society of Mechanical Engineers, on March 4th, was preceded by a dinner which was attended by over fifty members of the society. After dinner the members proceeded to the Engineers' Club where Mr. Miner Chipman, well known for his works on sociology, had been secured by Secretary Kinhead to give the address of the evening on the "American Plan of Shop Management." Mr. Chipman showed the reasons why the American plan had been adopted by shops throughout the country and gave concrete examples of how it was being tried out successfully. Mr. Chipman was followed by F. C. Metcalf, secretary of the California Metal Trades Association, who showed why the association had been forced to adopt a similar plan after failing to come to an understanding with the labor unions.

As a result of the discussion that followed, many minor points were brought out which showed that while all of the members were not in favor of the plan in its entirety, it certainly offered one logical solution of the present difficulties confronting the large employer of labor.

Among those present were:

President W. F. Durand, Secretary J. A. Kinhead, J. P. Rettenmayer, Miner Chipman, F. H. Metcalf, Prof. E. P. Lesley, Frank Duley, R. A. Balzari, Henning J. Berg, Bruce Lloyd, H. A. Olds, H. Hoffman, M. A. Cutten, J. Lynn Reynolds, Orvill Logan, A. C. Maynard, Howard C. Norton, M. R. Hickman, W. Hanscom, R. S. Springer, F. A. Blakeslee, John T. Johnston, P. Swanson, W. Edwards.

#### Central Station Day at Development League

At the March 22nd meeting of the San Francisco Electrical Development League central stations held sway, but a member of the Railroad Commission held control of them as usual by the kindly offices of Sergeant-at-Arms Jacobs. President E. O. Shreve announced the following committees before listening to the optimistic, stock-boasting talks of the various power companies' representatives:

General Committee for reception and entertainment of Eastern guests on the N. E. L. A. Red Special: H. F. Jackson, chairman, R. E. Fisher, vice-chairman, T. E. Harris, J. M. Black, R. A. Balzari, A. H. Elliot, Robert Sibley.

Finance Committee: Chas. Newberry, chairman, E. C. Kenney, W. B. Francis.

Membership Committee: Harry F. Hall, chairman, Emmet N. Britton, Tracy W. Simpson, F. A. Anderson, J. E. Gridley, W. R. Dunbar, G. G. Drew.

Reception and Attendance Committee: H. S. Jones, chairman, G. E. Armstrong, Earl P. Duxley, H. H. Millar, Walter F. Price.

Publicity Committee: H. C. Hopkins, chairman, M. P. Dolman, M. E. Hixson.

Sergeant-at-Arms: A. H. Halloran, chairman, Tracy W. Simpson, R. E. Fisher, Garnett Young.

Public Policy Committee: R. E. Fisher, chairman, Robert Sibley, D. E. Harris, Tracy Simpson, Garnett Young.

Program Committee: F. E. Boyd, chairman, H. Bostwick, R. E. Balzari, C. F. Butte, G. Jacobs, C. E. Ingalls, A. E. Rowe, W. B. Sawyer, R. J. Holtermann.

Mr. G. E. Armstrong, associate editor of the Journal of Electricity, was the chairman of the day and spoke briefly on the construction budgets of the power companies of California, which amount to fifty millions of dollars to be spent this year.

Capt. H. F. Jackson, vice-president of the Pacific Gas & Electric Company, spoke on the four projects which his company now have under way. By adding a third pipe line to the Sierra and San Francisco power house on the Stanislaus river the present pipe line loss will be reduced, and without any more water the plant will have an added capacity of 7,000 kw. This work will be finished by early fall. In utilizing a natural fall of 2500 feet on the south fork of the Stanislaus river 9,000 kw. will be added to the output of the system and a new record set for high-head hydroelectric plants in California. The first unit of the Pit river project will be completed by the end of the year and will consist of two 12,000-kw. turbines operating under a two hundred-foot head on the lower Pit. The fourth project will consist of a 12,500-kw. steam turbine which will probably be installed in Oakland by October.

The Great Western Power Company was represented by J. M. Black, sales manager, who spoke of the large development on the Feather river and the Caribou plant which will eventually generate 120,000 kw. The present installation, however, which will be finished by the end of the year, will consist of two 20,000-kw. generators. The transmission as far as Valona will be at 165,000 volts, and there it will be stepped down to 60,000 volts for further distribution.

In the absence of Mr. F. E. Hoar, consulting engineer of the Southern Sierras Power Company, Mr. Armstrong told of the contemplated additions to their small plants to the extent of approximately 4,000 kw.

Mr. Armstrong also told of the developments under way of the Southern California Edison Company, including the installation of a 30,000-kw. steam turbine at the Long Beach plant, one additional 16,000-kw. generator in Big Creek No. 2 plant, and the construction of Big Creek No. 8 with a capacity of 22,500 kva., which will be in operation inside of a year.



The installation of an additional 30,000-kw. unit in the Kern River No. 3 plant is being contemplated for this year also. The progress made on Shaver Lake will insure 46 million kw-hr. during 1921, which will be further swelled by the one hundred million kw-hr. from the Big Creek No. 8 plant.

Mr. A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation, was unable to attend the meeting, but sent a telegram of greetings and named Mr. Robert Sibley, editor of the Journal of Electricity, as his proxy. Mr. Sibley told of the growth of the San Joaquin Light & Power Corporation which has probably the greatest irrigating load in the world to its present installed capacity in twelve plants of 84,000 hp. The plans for 1920 are such as to nearly double the output of the company, the largest of the new developments being the Kerckhoff plant with an output of 45,000 hp. One unit of 17,500 hp. is being added to the Bakersfield steam plant which will more than double its capacity and another natural gas burning steam plant of 12,500 or 15,000 kw. is to be installed in the newly discovered gas fields of the Elk Hill territory. The Kings River development of 30,000 kw. will be completed in 1922 and other future developments include the rebuilding of the Kern River plant, giving it an output of 25,000 hp., rebuilding of the Tule River plant and the raising of the Crane Valley dam.

#### A. I. E. E. and N. E. L. A., Portland

The regular joint monthly meeting of the Portland sections of the A. I. E. E. and N. E. L. A. was held Tuesday, March 9th, at 8 p.m., in the auditorium of the University Club. The speaker of the evening was Mr. W. H. Crawford, manager of department of industries of the Portland Chamber of Commerce, and his subject was the Industrial Development of the Portland District.

The proposed Constitution of the Oregon Technical Council was read and adopted by both local sections, as follows:

#### ARTICLE I (A)

The name of the organization shall be The Oregon Technical Council.

#### ARTICLE I (B)

The purpose of this Council is to coordinate the work of the various technical, scientific and engineering organizations, to promote the welfare and professional standing of their members and to foster a more general recognition of the engineer in civic matters.

#### ARTICLE II (A)

The charter membership of this Council shall consist of two appointed representatives from each local section of the following national engineering societies: The American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Architects.

#### ARTICLE II (B)

Other technical, scientific or engineering organizations desiring to secure membership in the Council shall file with the Secretary thereof a petition accompanied by a copy of their constitution and a list of their officers and members. Membership in the Council shall be granted only by at least three-fourths affirmative vote of the members present at two successive meetings.

#### ARTICLE II (C)

Each organization shall have two representatives in the Council and may elect two alternates to serve in the absence or disability of such representatives.

#### ARTICLE II (D)

To insure permanency in the representation on the Council, member organizations shall arrange the initial election of their representatives so that their terms of office shall overlap at least six months.

#### ARTICLE III (A)

At the first regular session in each calendar year, the Council shall elect a President, Vice-President, Secretary-Treasurer, and two Directors. These five shall constitute the Executive Committee. No organization shall have more than one representative on the Executive Committee.

#### ARTICLE III (B)

Regular sessions of the Council shall be held once each month at such time and place as the Council shall designate.

#### ARTICLE III (C)

The president shall call special sessions of the Council upon written request of not less than two members of the Executive Committee.

#### ARTICLE III (D)

A quorum for the transaction of official business shall consist of at least one representative from two-thirds of the member organizations.

#### ARTICLE IV

Any member organization may be expelled from the Council for cause upon a three-fourths ballot of all members of the Council.

#### ARTICLE V

Such by-laws and rules as may be necessary for the future governing of the Council may be proposed at any regular meeting.

#### ARTICLE VI

Amendments to this constitution shall be proposed or approved by the Council, submitted to the member organizations for ratification and adopted upon a two-thirds favorable vote of such member organizations.

## WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

#### A. I. E. E.—WESTERN SECTIONS

##### National Officers

President—Calvert Townley, Westinghouse Electric & Manufacturing Company.  
Secretary—F. L. Hutchinson, Engineering Society, Bldg., New York City.  
Meetings—Monthly.

##### Denver Section

Chairman—Prof. H. S. Evans, Univ. of Colorado, Boulder.  
Secretary—Robt. B. Bonney, Mountain States Tel. & Tel. Co., Denver, Colo.  
Meetings—Third Saturday of each month, at the Shirley Hotel.

##### Los Angeles Section

Chairman—Clem. A. Copeland, Bureau of Power and light, Los Angeles.  
Secretary—R. W. Sorensen, California Institute of Technology, Pasadena, Cal.  
Meetings—Second Tuesday of each month.

##### Portland Section

Chairman—E. F. Whitney, General Electric Co., Electric Bldg., Portland, Ore.  
Secretary—W. C. Heston, Portland Ry. Light & Power Co., Portland, Ore.  
Meetings—Monthly.

##### San Francisco Section

Chairman—W. G. Vincent, 445 Sutter St., San Francisco.  
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.  
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

##### Seattle Section

Chairman—G. E. Quinan, Puget Sound Traction Light & Power Co., 205 Electric Bldg.  
Secretary—Willis T. Batcheller, Seattle Light & Power System, Seattle, Wash.  
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

##### Spokane Section

Chairman—J. E. E. Royer, Washington Water Power Co., Spokane, Wash.  
Secretary—Foster Russell, Symons Bldg., Spokane, Wash.  
Meetings—Third Friday of each month.

##### Utah Section

Chairman—Markham Cheever, Utah Power & Light Co., Salt Lake City, Utah.  
Secretary—T. A. Purton, General Electric Co., Newhouse Bldg., Salt Lake City, Utah.  
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

##### Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.  
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

#### A. I. E. E.—WESTERN BRANCHES

##### Idaho University Branch

Meetings—First Wednesday evening of each month from October to June.

##### Montana State College Branch

Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.

Meetings—Third Friday of every month of the school year in the Electrical Bldg.

##### Oregon Agricultural College Branch

Chairman—Lawrence Fudge, Oregon Agr. College, Corvallis, Ore.

Secretary—Otto L. Cantrall, Oregon Agr. College, Corvallis, Ore.

##### Stanford University Branch

Chairman—Aubrey Smith, Box 121, Stanford University.

Secretary—Hans O. Storm, Encina Hall, Stanford University.

##### State College of Washington Branch

Chairman—Clarence E. Guse, Pullman.  
Secretary—Ralph C. Guse, State College of Washington, Pullman.  
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

##### California Institute of Technology Branch

Chairman—R. M. Otis, Throop Dormitory, Pasadena, Cal.  
Secretary—D. D. Smith, Cal. Inst. of Tech., Pasadena, Cal.

##### University of California Branch

Chairman—H. C. Silent, University of California, Berkeley, Cal.  
Secretary—M. L. Almqvist, University of California, Berkeley, Cal.

##### University of Colorado Branch

Chairman—D. H. Rymer.  
Secretary—Lee J. Murray.  
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

##### University of Washington Branch

Chairman—G. R. Rice, Univ. of Washington, Seattle, Wash.  
Secretary—McKinley Donovan, Univ. of Washington, Seattle, Wash.  
Meetings—Monthly, first Tuesday, Forestry Bldg.

#### CONTRACTOR-DEALER ASSOCIATIONS

##### National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.  
Secretary—W. H. Morton, 110 West 40th St., New York.

Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland; J. F. NePage, Seattle.



**British Columbia Ass'n Electrical Contractors and Dealers**

President—E. Brettell, Vancouver, B. C.  
 Secretary—R. G. Hargreaves, 422 Pacific Bldg., Vancouver, B. C.  
 Meetings—First Tuesday of each month.  
**California Ass'n of Electrical Contractors and Dealers**  
 Chairman—Clyde L. Chamblin, 641 Mission St., San Francisco, Cal.  
 Secretary—J. W. Redpath, New Call Bldg., San Francisco, Cal.

**California Sections**

**East Bay Electrical Trades Association**  
 President—Hugh Kimball, 526—13th St., Oakland, Cal.  
 Secretary—J. M. Gregory, Woodmen of the World Bldg., 16th & Clay St., Oakland, Cal.  
**Electrical Contractors and Dealers Ass'n of San Francisco**  
 President—T. J. Bennett, Rex Electric Co., San Francisco.  
 Secretary—Louis R. Ardouin, San Francisco.  
**Imperial Valley Section**  
 President—Jerome Aiken.  
 Secretary—R. O. Graham, 123 Second St., Calexico, Cal.

**Kern County Section**

President—A. K. Carsen.  
 Secretary—H. J. Anderson, Taft, Cal.

**Long Beach Section**

President—J. W. Lane.  
 Secretary—A. R. Dunn, 233 East Third St., Long Beach, Cal.

**Monterey Bay Electrical Contractors and Dealers**

President—W. Cox, Santa Cruz.  
 Secretary—D. K. Noggle, Monterey.

**Northern California Electrical Contractors and Dealers**

President—W. H. Gribble, Sacramento.  
 Secretary—H. Berg, Sacramento.

**Orange County Section**

President—W. B. Holland, Alhaim, Cal.  
 Secretary—H. J. Snow, Orange, Cal.

**Orange Belt Section**

President—E. J. Field.  
 Secretary—H. A. Snyder, 337 F Street, San Bernardino, Cal.

**Sacramento Section**

President—J. C. Hobrecht.  
 Secretary—Jas. Woods, 1110 J Street, Sacramento.

**Santa Clara Section**

President—Chas. Faser, 10 S. 10th St., San Jose.  
 Secretary—P. D. Cambiano, 161 S. 2nd St., San Jose.

**San Diego Section**

President—J. H. Leavitt.  
 Secretary—J. F. Zwiener, 995 So. St., San Diego.

**San Joaquin Section**

President—H. H. Courtright.  
 Secretary—Clyde Smith, 1230 J St., Fresno.

**San Mateo Section**

President—H. B. Weaver.  
 Secretary—M. E. Ryan, 205 Main St., Redwood City.

**Southern California Electrical Contractors and Dealers**

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.  
 Secretary, Assistant—H. M. Mikesell, 628 Union Bldg., Los Angeles, Cal.

**Denver Electrical Contractors' Association**

President—E. C. Headrick.  
 Secretary—C. N. Shannon, 227 Coronado Bldg.  
 Correspondence Secretary—L. B. Roberts, 227 Coronado Bldg., Denver, Colo.  
 Meetings, 2nd and 4th Monday nights of each month.

**Electrical Contractors & Dealers of Salt Lake City**

President—G. W. Forsberg.  
 Secretary—E. H. Eardley, Eardley Bros., Salt Lake City.  
 Meetings—Saturdays, 1 p.m.

**Oregon State Ass'n of Electrical Contractors and Dealers**

President—R. C. Kenney, 388 Burnside Street, Portland.  
 Secretary—U. P. Mundt, Portland, Ore.

**Portland Local Ass'n of Electrical Contractors and Dealers**

President—Roy C. Kenney, Portland.  
 Secretary—H. C. Jones, 306 Concord Bldg., Portland.  
 Meetings—Alternate Mondays at Imperial Hotel Grill.

**Washington Ass'n of Electrical Contractors and Dealers**

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.  
 Secretary—Forrest E. Smith, Seattle, Wash.  
 Meetings—Quarterly—second Thursdays of March, June, September and December.

**JOBBER'S ASSOCIATIONS****Electrical Supply Jobbers Association**

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.  
 Meetings—Semi-annual.

**Pacific Coast Electrical Supply Jobbers**

President—T. E. Bibbins, 575 Mission St., San Francisco.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—Quarterly.

**Electrical Credit Ass'n of the Pacific Coast**

President—J. H. Zweifel, Electrical Appliance Co., San Francisco.  
 Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—Annually; San Francisco; May.

**OF ELECTRICAL INTEREST****California Electrical Cooperative Campaign**

Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.

Secretary—Captain Howard Angus, New Call Bldg., San Francisco.

**Colorado Electric Light, Power and Railway Association**

President—E. A. Phinney, Jefferson Co. Power & Light Co.

Secretary-Treasurer—F. P. Safford, Denver Gas & Electric Co., Denver, Colo.

**Electric Cooperative League of Los Angeles**

President—Ralph B. Clapp, San Fernando Bldg., Los Angeles.

Secretary-Treasurer—Carl M. Heintz, Westinghouse Electric & Mfg. Co., Los Angeles.

**Electric Metermen's Association**

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.

Secretary—A. E. Coney, Great Western Power Company, San Francisco.

Meetings—About every 60 days.

**Illuminating Engineering Society**

President—S. E. Doane.

Secretary—Clarence L. Law.

Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Co., Portland, Ore.; W. R. Putnam, Utah Power & Light Co., Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.

Meetings—First Tuesday each month.

**National Electric Light Association**

President—R. H. Ballard, Southern California Edison Company.

Secretary—T. Comerford Martin, 29 West 39th St., New York.

**New Mexico Electrical Association**

President—E. A. Roberts, Public Utilities Co., Carlsbad, New Mexico.

Secretary—Chas. E. Twogood, Albuquerque Gas & Electric Company, Albuquerque, N. Mex.

**Northwest Electric Light and Power Ass'n**

President—John B. Fiske, Washington Water Power Company.

Secretary—L. A. Lewis, Spokane, Wash.

Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

**Pacific Coast Section, N. E. L. A.**

President—A. E. Wishon, San Joaquin Light & Power Corporation, Fresno, Cal.

Secretary—A. H. Halloran, Journal of Electricity, Rialto Bldg., San Francisco.

Meetings—Annually, in April.

**Portland Section, N. E. L. A.**

Chairman—F. H. Murphy, Portland Railway Light & Power Company.

Secretary—Geo. Bowen, Portland, Ore.

**San Francisco Electrical Development League**

President—E. O. Shreve, General Electric Co., San Francisco.

Secretary—R. D. Compton, Pacific Gas & Electric Co., San Francisco, Cal.

Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel, San Francisco.

**Southwestern Electrical and Gas Association**

President—W. A. Sullivan, Shreveport, La.

Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

**Synchronous Club**

Secretary—H. N. Beecher, City Hall, Los Angeles.

**Telephone and Telegraph Society of the Pacific Coast—San Francisco Section**

President—W. H. Brommage, Pacific Tel. & Tel. Co., San Francisco.

Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

**MECHANICAL ENGINEERS****National Officers**

President—Mortimer E. Cooley, Electrical Engineering Dept., Ann Arbor, Mich.

Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

**Los Angeles Section, A. S. M. E.**

President—Charles H. McGuire.

Secretary—T. J. Royer.

Meetings—Quarterly.

**Oregon Section, A. S. M. E.**

President—B. C. Hall, Willamette Iron & Steel Works.

Secretary—E. W. Lazell, Chem. & Efficiency Engr., 537 Railway Exchange Bldg., Portland.

**San Francisco Section, A. S. M. E.**

President—W. F. Durand, Stanford University, Palo Alto, Cal.

Secretary—Jas. A. Kinkead, Rialto Bldg., San Francisco.

Meetings—Quarterly.

Thursday lunches have been arranged at the Engineers' Club, 57 Post St.  
 Washington Section A. S. M. E.  
 President—E. O. Eastwood, Univ. of Wash.

**AMERICAN ASSOCIATION OF ENGINEERS****National Officers**

President—W. H. Finley, President Chicago & Northwestern Railroad.

Secretary—Frederic Bass, 29 S. La Salle St., Chicago.

**Los Angeles Chapter, American Ass'n of Engineers**

President—E. G. Shibley.

Secretary—A. L. Harris, Central Bldg., Los Angeles.

**Oregon Chapter, American Ass'n of Engineers**

President—W. H. Marsh.

Secretary—R. W. Barnes.

**Pacific Northwest Society of the American Ass'n of Engineers**

President—S. D. Clinton, Vulcan Iron Works.

Secretary—J. A. Hopkins, Seattle Boiler Works.

San Francisco Chapter, American Ass'n of Engineers

President—William S. Wollner.

Secretary—A. G. Mott.

**ENGINEERS' SOCIETIES****Engineers' Club of Oakland**

President—R. S. Chew, Oakland Chamber of Commerce, Oakland, Cal.

**Engineers' Club of Sacramento**

President—George S. Nickerson, 914 Forum Bldg., Sacramento.

Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento, Cal.

**Engineers' Club of San Francisco**

President—Ely C. Hutchinson, Pelton Water Wheel Company, San Francisco.

Secretary—Allen G. Jones, Rialto Bldg., San Francisco.

Annual Meeting—October.

**The Engineers' Club of Seattle**

President—H. E. Horrocks, Seattle, Wash.

Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.

Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

**JOINT ORGANIZATIONS****Colorado Engineering Council**

President—Arthur Ridgway, 810 Equitable Bldg., Denver.

Secretary-Treasurer—Robert J. Grant, 614 Interstate Trust Bldg., Denver.

**Joint Committee Technical Societies of Los Angeles**

Chairman—George A. Damon, San Fernando Bldg., Los Angeles.

Secretary—W. K. Barnard, 705-6 Central Bldg., Los Angeles.

**Joint Council of the Societies of San Francisco**

Chairman—C. D. Marx, Stanford University.

Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

**Spokane Engineering and Technical Ass'n**

President—L. K. Armstrong, A. S. M. E.

Secretary—A. D. Butler, City Engineer, Spokane, Wash.

Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

**MISCELLANEOUS****American Ass'n for the Advancement of Science—Pacific Division**

President—John Campbell Merriam, University of California; Acting Chairman National Council of Research.

Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.

Meetings—Annual.

**Foreign Trade Club**

President—W. H. Hammer, Monadnock Bldg., San Francisco.

Secretary—Aubrey Drury, Monadnock Bldg., San Francisco.

Meetings—233 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

**Idaho Society of Engineers**

President—W. H. Gibson, Mountain Home, Idaho.

Secretary—Ira F. Shaffner, Boise, Idaho.

**Pacific Coast Gas Association**

President—A. B. Day, Los Angeles Gas & Electric Co.

Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

**Society for Promotion of Engineering Education**

Secretary—H. J. Bishop, University of Pittsburgh, Pittsburgh, Pa.

**Utah Society of Engineers**

President—Leonard Cahoon

Secretary—Wm. H. Kelsey.  
 Meetings—3rd Wednesdays except May, June, July and August.  
 Annual Banquet—May.



## HAPPENINGS IN THE INDUSTRY

### DEMONSTRATION OF WESTERN RAILWAY ELECTRIFICATION

The departure of the first Milwaukee Olympian on the Pacific Division of the Chicago, Milwaukee & St. Paul Railroad was observed by a party of more than a hundred railroad and transportation officials in addition to prominent Seattle and Tacoma citizens who traveled as guests on a special train. This demonstration, the first actual operation of the electrified system, began at 9:30 on the morning of March 5th when the special train, pulled by a steam engine, left the Oregon-Washington depot at Seattle. The Olympian followed a few minutes later, a limited train also hauled by a steam locomotive. At Renton junction two electric locomotives waited. At this point starts the electric trolley, which stretches more than 200 miles over the mountains to Othello. Here the electric locomotive was coupled to the special train. A few moments afterwards another electric locomotive was coupled to the Olympian. With the special train and its guests in the lead and the Olympian following, the current from a 3000-volt overhead trolley was turned into the locomotive motors. A speedy momentum was quickly attained and the train sped up the foothills past Renton and Maple Valley to Cedar Falls, where a stop was made while guests and officials inspected the sub-station of the Milwaukee system. This station is fed by 160,000 volts of alternating current. The following guests had passage on the train:

Officials of the Puget Sound Traction, Light & Power Company: A. W. Leonard, W. J. Grambs, D. C. Barnes, John Harisberger, R. T. Sullivan, George Newell, H. B. Sewall, George Quinan, H. J. Gille, E. A. Batwell, E. H. Thomas, W. H. Somers and Judge C. W. Howard.

Milwaukee railroad officers: Vice-President H. B. Earling, 'Macy' Nicholson, general manager; J. L. Brown, assistant superintendent; J. R. Vietch, assistant traffic manager; R. Beeuwkes, chief electrical engineer; F. B. Walker, H. W. Williams, F. L. Tavenner, A. P. Chapman, W. L. Hubbard, E. F. Weeks, J. F. Bahl, A. J. McCarthy and R. F. Randall, all of Seattle; E. A. Lalk, F. J. Alleman and F. C. Dow, of Tacoma; and W. P. Warner, of Spokane.

Seattle railroad and transportation men from other lines: W. H. Olin, O-W. R. & N.; G. W. Mertens, general manager Pacific Coast line; R. Herzog, Great Northern (chief engineer); H. R. Williams, A. I. Bouffleur, M. B. Childs, W. C. Dawson, C. D. Phillips, A. F. Marion, O. S. Bowen, A. R. Cook and Charles E. Peabody.

Tacoma guests comprised Maj. C. M. Riddell; M. F. Alexander, Admiral line president; J. T. Davis, president Commercial Club; I. B. Richards, general superintendent Northern Pacific; J. W. McCune, Commercial Club; M. Higuchi, O. S. K. line; A. M. Ingersoll, A. B. Howe, C. R. Welch, R. Pinkerton and Frank S. Baker.

Seattle guests were: S. H. Hedges, president Chamber of Commerce; Joseph Blethen, of the Times; Clark Nettleton, Post Intelligencer; R. H. Dean, Milwaukee line; John H. Longfellow, Journal of Electricity; J. B. Cox, E. E. Kimball and Allan W. Eshelby of the Westinghouse Electric & Manufacturing Company; Kenneth Kerr, Railway and Marine News; Claude A. Osler, Electric Railway Journal; W. A. Scott, Electrical Review, and S. Kaneko of the O. S. K. line.

Other guests were R. B. Childs, Intermountain Power Company, Butte; Rene Martin, Thomson-Houston Company, London; W. S. Elliott, general manager O-W. R. & N., Spokane; W. H. Wingate, train master Chicago, Milwaukee & St. Paul Railroad, Tacoma; William Emerson, traveling engineer; Frank Busch, superintendent motive power, and R. J. Middleton, assistant chief engineer, Chicago, Milwaukee & St. Paul Railroad.

### RECLAMATION PROJECT OUTLINED BY LANE

The Los Angeles Chamber of Commerce recently held a luncheon in honor of Franklin K. Lane, ex-Secretary of the Interior. At this time Mr. Lane gave an address on the task of harnessing the Colorado river. He believes this project would convert 1,500,000 unproductive acres into fruitful farms and orchards. It would be the most colossal irrigation project ever undertaken on the American continent. Mr. Lane summed up the entire outlook in saying:

"There are in the southwest today 1,500,000 acres which must lie idle until somebody with the money, coupled with the ability to organize engineering sense, undertakes to store the waters of the Colorado river and its principal tributaries all the way from Wyoming to the Grand Canyon, for the purpose of spreading it out over a vast expanse of unproductive acres, which the world will presently need.

"I have lately had engineers at work on a plan of my own, which contemplates making the Grand Canyon the greatest impounding reservoir the world has ever known. Can you offer any good reason why we can't break down the walls of the Grand Canyon, 100 miles this side of El Tovar, creating a gigantic irrigation water reservoir. Such a project would create the greatest dam of its kind in the world."

Mr. Lane made a very direct appeal to his audience when he said: "Why may I not challenge you gentlemen of Los Angeles to bring such pressure to bear upon Congress and upon the people of the United States that they will see an opportunity to do a great thing for this section of our land, and for all sections of our land, by making the Colorado



The above photo was taken while transportation officials were inspecting the Cle Elum Milwaukee substation in connection with the first electrification of the system. These men have made possible, through their efforts and progressiveness, the harnessing of the water power of western Washington so that it now moves transcontinental trains across the Cascade Mountains. The last man on the right is R. Beeuwkes, chief electrical engineer of the line.



river what it may be, the most useful single river of the United States in the amount of crops that it can be made to produce."

Mr. Lane's entire address was received with great enthusiasm.

### PLANS FOR WATER POWER LEGISLATION

The Sacramento Valley Irrigation and Water Congress has perfected a permanent organization to expedite its program of water conservation and just distribution by means of legislation. The organization will make the following requests of the Legislature when it is next convened:

- 1—Creation by the Legislature of state conservation and flood control districts, embracing proper watershed areas.
- 2—State participation in financing and constructing water storage reservoirs.
- 3—State control of reservoirs and the apportionment of stored waters by state agencies.

Much opposition followed the introduction of a resolution by Fred Shaffer, Yolo county delegate, asking state authorities to apportion water for agricultural purposes in preference to hydroelectric companies during times of emergency. Shaffer's resolution, which was finally referred to the state relations committee, was intended to curtail the use of water by gold dredging outfits during periods of drought.

Proponents of the resolution asserted that hydroelectric companies are now furnishing gold dredgers in the Sacramento Valley with ten thousand horsepower, a force capable of irrigating approximately 200,000 acres of land. The resolution was opposed on the ground that the matter should be carefully studied by a committee before any action was taken that would tend to lessen the gold output at a time when it is needed by the nation.

### ENLARGEMENT OF REFRIGERATING FACILITIES

To cope with the increase of California products, the Pacific Fruit Express is planning to spend two million dollars this year in enlarging its icing facilities. This is in addition to the 4,000 new refrigerator cars already announced which will cost between fifteen and sixteen million dollars. Regardless of the high cost of machinery, building materials and labor, the company is making an effort to provide shippers with the increased facilities they require for preservation and transportation of their products.

The contemplated improvements will include:

Roseville, California—Conversion of plant to electric drive, installation of additional 150-ton daily electric driven unit and extension of icing platform at a cost of \$239,000.

Colton, California—Installation of additional 175-ton daily electric driven unit, and increase in day storage at a cost of \$210,500.

Los Angeles—Conversion of steam plant to electric drive; installation of additional 100-ton daily electric driven unit and construction of 12,000-ton storage room.

Sparks, Nevada—Abandonment of the icing station at Truckee and the establishing of a regular icing station at Sparks for all shipments moving over the Southern Pacific under refrigeration. Construction of an electric driven artificial ice manufacturing plant of 150 tons daily capacity and 20,000 tons storage, costing \$369,500.

### AMERICAN ASSOCIATION OF ENGINEERS REDUCES ENTRANCE FEE

All members of National Engineering Societies may now join the American Association of Engineers at a reduced fee. The fee for such applicants is now five dollars instead of ten dollars. The membership now numbers thirteen thousand in the United States. The San Francisco chapter has over four hundred members.

### Northwest Electric Light and Power Association

The personnel of the governing committee of the Public Relations Section of the Northwest Electric Light and Power Association has been named, as follows:

John A. Laing, Pacific Power & Light Co., Portland, Ore.  
Geo. D. Brown, Wenatchee Valley Gas & Electric Co., Wenatchee.  
Eugene Enloe, Okanogan Valley Power Co., Spokane, Wash.  
N. W. Brackett, Puget Sound T. L. & Pwr. Co., Seattle, Wash.

O. G. F. Markhus, Idaho Power Co., Boise, Idaho.  
Odell McConnell, Helena Light & Ry. Co., Helena, Mont.  
R. M. Boykin, North Coast Power Co., Portland, Ore.

The governing committee of the Commercial Section of this association is made up of the following:

R. W. Clarke, Puget Sound T. L. & Pwr. Co., Seattle, Wash.  
J. V. Strange, Pacific Power & Light Co., Portland, Ore.  
A. C. McMicken, Portland Ry. L. & Pwr. Co., Portland, Ore.  
J. S. Groo, Northwestern Electric Co., Portland, Ore.  
J. F. Farquhar, Washington Water Power Co., Spokane, Wash.  
W. R. Putnam, Idaho Power Co., Boise, Idaho.  
J. Ryan Gaul, Montana Power Co., Butte, Mont.  
O. P. Cull, Wash. Coast Utilities Co., Seattle, Wash.  
R. E. Baily, Utah Power & Light Co., Salt Lake City, Utah.

The personnel of the governing committees of the Accounting, Hydroelectric and Technical Sections will be announced in the near future.

### INCREASED OIL PRICES

The Standard Oil Company of California recently announced an increase of \$0.25 per barrel in the price of fuel oil. Immediately thereafter a letter was addressed to K. R. Kingsbury, president of the Standard Oil Company, by the Railroad Commission signed by all of the Commissioners, requesting that the Standard Oil Company make a statement as to the reasons for the increase in the price of crude oil, with the further statement that the increase in the price of oil would necessitate an increase in the rates to be charged for electricity and gas throughout the state. The primary intention of the Railroad Commission in writing its letter was to call attention to the need for remedial legislation that would give some public body the authority to review and fix prices of crude oil.

In reply to the Commission's letter Mr. Kingsbury made the following statement:

"The Pacific Coast's supply of fuel oil and of petroleum products is rapidly approaching exhaustion. Since May 1st, 1915, crude oil stocks in California have decreased from over 60,000,000 barrels to 28,738,921 barrels on March 1st, 1920. The available supply of crude oil in stock is today less than 13,000,000 barrels. The balance of the stocks are taken up in the factor of safety of 10,000,000 barrels which the Petroleum Committee of the State Council of Defense found essential to the safety of Pacific Coast industries, and in the oil pipe lines and tank bottoms estimated at 6,000,000 barrels. At the present rate of consumption over production the available stock will be exhausted in one year, after which the consumption of oil must be reduced 25,000 to 30,000 barrels per day. No advance in the price of oil has been made by the Standard Oil Company for nearly two years, or since May 1, 1918, when the United States Fuel Administration directed a \$0.25 increase per barrel.

The following tabulation covers the record for the past five years:

Date	Crude Oil Stocks	Price at Well	Price at Seaboard
Jan. 1, 1916	57,147,051	\$0.43	\$0.80
Jan. 1, 1917	44,036,910	0.73	1.15
Jan. 1, 1918	32,450,465	0.98	1.45
Jan. 1, 1919	32,043,923	1.23	1.60
Jan. 1, 1920	30,480,323	1.23	1.60
Mar. 1, 1920	28,738,921	1.23	1.60

In 1918 the average daily consumption was 279,576 barrels. The last half of 1919 it was 292,278 barrels. In January, 1920, 301,100 barrels and in February, 1920, 304,120 barrels. In addition to this the fact is brought out that 7,000 barrels of fuel oil per day, which formerly went to Arizona from California, is now going to Arizona from Texas and Mexico. Added to these considerations are the demands of the Navy and of the United States Shipping Board. The former estimates its 1920 requirements on the Pacific Coast at 2,950,800 barrels as against 1,532,650 barrels in 1919. The Shipping Board has estimated theirs for 1920 at 4,000,000 barrels. \* \* \* The California market for fuel oil and its products has ceased to be of only local interest. It has acquired a national and international importance. \* \* \* California will be drawn upon for oil in the relation that California prices bear to prices elsewhere. The inevitable result will be that the Pacific Coast will be further drained of its supply by competition with other markets. It is obvious that there will not be enough oil to go around unless (1) production is increased or (2) the demand is conserved. We know of no other step to accomplish these results than an increase in the price offered for fuel oil and the price at which it is sold.

The condition today is even more serious than it was in 1918. The stocks are 4,000,000 barrels below the figure for that time and the consumption has increased a half-million barrels per month. There is further the fact that improved refining processes will reduce the available fuel oil within one year about 30%, equivalent to 20,000 barrels per day.

Following the 1918 advance in price the decrease of California stocks was checked. For the first time in three years the supply exceeded the demand—due to a diminished demand and stimulated production.

The Standard Oil Company is not eager to advance its prices for oil. This is proven as its competitors for three years have paid higher prices for refinable crude than has that company. In its efforts to promote conservation of the products of petroleum that company sells no crude petroleum for fuel oil, it sells only the residuum resulting from the distillation of crude oil. The present inability of hydroelectric companies to furnish their normal market with power, will throw on the oil industry the added burden of the demands of those consumers who heretofore used electric power and will now turn to fuel oil.



## OIL STATISTICS FOR THE MONTH OF FEBRUARY

District	Gross Barrels	February	January	Daily Average			
				1919	1918	1917	1916
Kern River .....	601,040	20,725	20,654	20,907	22,083	23,543	23,397
McKittrick .....	209,737	7,232	7,186	7,773	8,385	8,974	9,170
Midway-Sunset .....	2,642,939	91,136	88,470	88,985	95,429	101,628	107,323
Lost Hills-Belridge .....	344,193	11,869	11,853	12,770	14,967	17,423	13,352
Coalinga .....	1,283,437	44,257	44,639	44,956	44,823	43,559	39,434
Santa Maria .....	473,331	16,339	16,306	16,665	19,747	16,393	11,973
Ventura-Newhall .....	161,379	5,565	5,310	4,858	3,827	3,115	2,976
Los Angeles-Salt Lake .....	112,589	3,882	3,606	3,625	3,691	3,981	4,739
Whittier-Fullerton .....	2,168,265	74,768	76,341	78,512	68,115	49,131	39,478
Summerland .....	4,500	155	145	148	148	148	147
Total .....	8,001,910	275,928	274,510	179,199	281,215	267,895	251,989
January .....	8,509,805	274,510		275,928	275,928	275,928	275,928
Difference .....	507,895	1,418		3,271	5,287	8,033	23,939

## SHIPMENTS AND STOCKS

Stocks February 1, 1920 .....	26,893,730
February production .....	8,001,910
Total .....	34,895,640
February shipments .....	8,926,466
Stocks March 1, 1920 .....	25,969,174
Stocks decrease February .....	924,556
Stocks January 1, 1920 .....	27,804,391
Total 1920 shortage .....	1,835,217
Daily average .....	30,587

## DAILY AVERAGE

	February	January	1919	1918	1917	1916
Daily Production .....	275,928	274,510	279,199	281,215	267,895	251,989
Shipments .....	307,809	303,886	282,873	290,836	297,986	285,789
Shortage .....	31,881	29,376	3,674	9,621	30,091	33,800

The Standard Oil Company understands that the Commission's primary interest in this matter is in relation to the price of fuel oil for public utilities. The public also is interested in the price of gasoline and gasoline must be kept at a price level where it will not be shipped to other markets in quantities sufficient to deplete the California market. At the present time there is a 9c. difference in the price of gasoline between California and New York and as the rail rate to New York is 7c. per gallon and the water rate 4c., there is a differential which allows wholesalers, jobbers and others to ship California gasoline east at a profit. This may lead to a demoralization of the local market. The increase in the price offered for crude oil at the wells was made in the hope that an increase of \$0.25 per barrel would stimulate production and tend to restore the balance between supply and demand. Past history has indicated that an increased price will result in an increased production and that an increase in price tends to conserve the use of fuel and check the depreciation of stock.

In the last analysis the Standard Oil Company is only one factor in the situation. It is the aggregate production of some 600 producers in California who alone can ameliorate the condition. The Standard Oil Company has strained every effort to increase its production for the purpose of meeting the shortage in the supply. This was done by intensive drilling and by the purchase and development of additional property. Having increased its own production to the maximum of its ability, that company sees no other course to increase the supply than to stimulate the others by offering a higher price for their product. The Standard Oil Company further states that they are currently declining export orders which return a larger profit than local sales.

## CIVIL SERVICE EXAMINATIONS

The United States Civil Service Commission announces competitive examinations for marine, mechanical and electrical engineers, to be held on the 20th of April. Vacancies in the office of the Chief of Transportation Service, War Department, for duty at Washington, D. C., and throughout the United States, at \$2,400 to \$4,000 a year, will be filled from these examinations, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion. Both men and women are eligible, but appointing officers have the legal right to specify the sex desired in requesting certification of eligibles. Competitors will not be required to report at any place, but will be rated on the following subjects, which will have the relative weights indicated:

Subjects	Weights
1. Education and experience .....	80
2. Publications, reports, or thesis (to be filed with application) .....	20
Total .....	100

Under the first subject competitors will be rated upon the sworn statements in their applications and upon corroborative evidence.

This tabulation gives the California state oil statistics for the month of February. It is given here in addition to the accompanying statements which have been set forth by the Standard Oil Company and is given also as an independent source of information on the general subject of the oil situation in the State of California at this time.

**Marine Engineer.**—The duties of this position require training and experience in the designing of steel and wooden hulls of various classes of small-sized vessels.

**Mechanical Engineer.**—The duties of this position require training and experience in the manufacture, installation, or operation of mechanical equipment in connection with marine construction.

**Electrical Engineer.**—The duties of this position require training and experience in electrical machinery construction, testing of electrical machinery, installation of electric wiring, electrical machinery, or radio equipment in connection with marine construction.

## TRADE NOTES

## Construction of Four Buildings —

The Westinghouse Electric & Manufacturing Company has contracted with the Westinghouse, Church & Kerr Company to construct four new buildings at the plant in South Philadelphia. The expansion is intended to take care of the immediate needs incidental to the removal of the machine works (formerly the Westinghouse Machine Company) from East Pittsburgh.

The four buildings will be made of terra cotta and steel, and will be similar to the present buildings in construction and design. The new one-story machine shop will be used for building small turbines, another new shop will be used for the construction of large land and steam turbines. The erecting shop will be extended to meet the new machine shop and a three-story building will be constructed to provide warehouse facilities.

In order that the series on public utility relationships, by S. M. Kennedy, may extend through the special convention issues in May, the eleventh article of the series will be held over until the May 1st issue.



## N. E. L. A. Convention Program

(The entire electrical industry in the West is looking to the big N. E. L. A. Convention which is to be held on this side of the continent for the first time this year. The following program, which includes a great many papers of interest to all branches of the electrical industry, convinces one that the programs of no previous conventions have equaled this in general scope or in the extent of social activities planned.—The Editor.)

Following is the program outlined for the convention of the National Electric Light Association at Pasadena, May 18th to 22nd. This is a tentative draft, subject to revision.

### General Sessions

#### First General Session—Wednesday, May 19th, 9:30 A.M.

"Welcome to California." Hon. William D. Stephens, Governor.  
Address by President R. H. Ballard, Southern California Edison Company, Los Angeles.  
Appointment of Committee on President's Address.  
Reports: Executive Manager, M. H. Aylesworth. National Electric Light Association, New York.  
Committee on Water Power Development. Franklin T. Griffith, chairman. Portland Railway, Light & Power Co., Portland, Oregon.  
Committee on Rate Research. Alex Dow, chairman. The Detroit Edison Co., Detroit.  
Lamp Committee. Frank W. Smith, chairman. The United Electric Light & Power Co., New York.  
Insurance Expert, W. H. Blood, Jr., Stone and Webster, Boston.  
Address: Chairman of Commercial Section, John G. Learned. Public Service Co. of Northern Illinois, Chicago.  
Division Report, Merchandise Sales Bureau; Electric Range. J. Paul Clayton, chairman. Central Illinois Public Service Co., Springfield.

#### Second General Session—Thursday, May 20th, 9:00 A.M.

Reports: Committee on Company Sections. F. A. Birch, chairman. The Philadelphia Electric Co., Philadelphia.  
Committee on Geographic Sections. R. J. McClelland, chairman. American Business Corporation, New York.  
Address: (Speaker and subject to be announced by Lighting Sales Bureau.)  
Report of Committee on Commercial Service and Relations with Customers. R. F. Bonsall, chairman. Consolidated Gas, Electric Light and Power Co., Baltimore.  
Election: Nominating Committee.  
Report of Committee on Constitution and By-Laws. W. C. L. Eglin, chairman. The Philadelphia Electric Co., Philadelphia.  
Appointment of Committee on Memorials and Committee on Resolutions.  
Report of Bureau on Advertising and Publicity Service. L. D. Gibbs, chairman. The Edison Electric Illuminating Co. of Boston.  
Paper by Service Committee. S. M. Kennedy, chairman. Southern California Edison Co., Los Angeles.  
Reports. Membership Committee. Walter Neumuller, chairman. The New York Edison Co., New York.  
Treasurer, H. C. Abell. American Light and Traction Co., New York.  
Address by E. O. Edgerton, president California Railroad Commission, San Francisco.

#### Third General Session—Friday, May 21st, 9:00 A.M.

Address: Chairman Accounting Section. R. W. Symes, The Detroit Edison Co., Detroit.  
Reports: Committee on Accounting Education. Douglass Burnett, chairman. Consolidated Gas, Electric Light & Power Co., Baltimore.  
Committee on Relations with Educational Institutions. John F. Gilchrist, chairman. Commonwealth Edison Co., Chicago.  
Committee on Accident Prevention. Charles B. Scott, chairman. Bureau of Safety, Chicago.  
Committee on Safety Rules. W. C. L. Eglin, chairman. The Philadelphia Electric Co., Philadelphia.  
Address: Chairman Technical and Hydro-Electric Section. I. E. Moulthrop. The Edison Electric Illuminating Co. of Boston.  
Reports: Committee on Inductive Interference. A. E. Silver, chairman. Electric Bond and Share Co., New York.  
Committee on Electrification of Steam Railroads. Frank M. Kerr, chairman. Montana Power Company, Butte.  
Address: (Speaker and subject to be announced by Power Sales Bureau.)  
Paper: Carl D. Jackson, chairman. Wisconsin Railroad Commission, Madison.  
Report by Committee on Electrical Resources of the Nation. M. S. Sloan, chairman. Brooklyn Edison Co., Inc., Brooklyn.

#### Fourth General Session—Saturday, May 22nd, 9:00 A.M.

Address: Chairman Electric Vehicle Section. George B. Foster, Commonwealth Edison Co., Chicago.  
Paper: "Electric Machinery For All Handling—An Opportunity." Zenas W. Carter, secretary. Material Handling Machine Manufacturers' Association, New York.  
Reports: Public Information Committee. John F. Gilchrist, chairman. Commonwealth Edison Co., Chicago.  
Committee on Bonus Systems. Harry A. Snow, chairman. The Detroit Edison Co., Detroit.  
Education Committee. Fred R. Jenkins, chairman. Commonwealth Edison Co., Chicago.  
Insurance Committee. E. J. Fowler, chairman. Commonwealth Edison Co., Chicago.  
Committee on Cooperation in the Industry. Lee H. Newbert, chairman. Pacific Gas & Electric Co., San Francisco.  
Committee on Sale of Company Securities to Customers and Resident Citizens. George R. Jones, chairman. Public Service Co. of Northern Illinois, Chicago.  
Committee on Doherty and Billings Prizes. A. S. Loizeaux, chairman. Consolidated Gas, Electric Light and Power Co., Baltimore.  
Committee on President's Address.  
Committee on Constitutional Amendments.  
Committee on Memorials.

Committee on Resolutions.  
Nominating Committee.

Election and Installation of Officers.

### Accounting Section

#### First Afternoon Session—Thursday, May 20th, 2:30

R. W. SYMES, Chairman  
J. C. VAN DUYNE, Vice-Chairman

Address: Section Chairman, R. W. Symes. The Detroit Edison Co., Detroit.  
Appointment of Nominating Committee.  
Reports: Committee on Credits and Collections. David Darlington, chairman. The New York Edison Co., New York.  
Committee on Classification of Accounts and Accounting Relations with Other Associations. Wm. Schmidt, Jr., chairman. Consolidated Gas, Electric Light and Power Co., Baltimore.  
Committee on Form of Annual Reports to Commissions. W. J. Myers, chairman. The United Electric Light and Power Co., New York.  
Committee on Merchandising Accounting. C. W. Johnson, chairman. Public Service Electric Co., Newark, N. J.  
Committee on Accounting Service to Member Companies and the Monthly Bulletin. Frederick Smith, chairman. The New York Edison Co., New York. L. A. Coleman, Editor. The United Electric Light and Power Co., New York.  
Committee on Motor Vehicle Records. G. P. Landwehr, chairman. The Philadelphia Electric Co., Philadelphia.

#### Second Afternoon Session—Friday, May 21st, 2:30

R. W. SYMES, Chairman  
J. C. VAN DUYNE, Vice-Chairman

Reports: Committee on Purchasing and Storeroom Accounting. W. F. Stevens, chairman. The Edison Electric Illuminating Co. of Boston.  
Committee on Federal Income Tax Procedure. H. E. Addenbrooke, chairman. Commonwealth Edison Co., Chicago.  
Committee on Customers' Records and Billing Methods. J. D. Jacobus, chairman. The Detroit Edison Co., Detroit.  
Nominating Committee on Section Officers.  
Election of Officers and Executive Committee.

### Commercial Section

#### First Afternoon Session—Wednesday, May 19th, 2:30

JOHN G. LEARNED, Chairman  
M. S. SEELMAN, Vice-Chairman  
HENRY HARRIS, Vice-Chairman

Address: Section Chairman, John G. Learned. Public Service Co. of Northern Illinois, Chicago.  
Report of Finance Committee. M. S. Seelman, chairman. Brooklyn Edison Co., Inc., Brooklyn.  
Appointment of Nominating Committee.  
Reports: Committee on Constitutional Amendments. R. H. Tillman, chairman. Consolidated Gas, Electric Light and Power Co., Baltimore.  
Committee on Wiring. R. S. Hale, chairman. The Edison Electric Illuminating Co. of Boston.  
Bureau of Merchandising Sales. E. A. Edkins, chairman. Commonwealth Edison Co., Chicago.  
Electrical Merchandise Division. F. D. Pemberton, chairman. Public Service Electric Co., Newark, N. J.  
Division on Present and Prospective Conditions of Central Station Merchandising. Stanley A. Dennis, chairman. McGraw-Hill Publishing Co., New York.  
Electric Shop Management Division. C. E. Greenwood, chairman. The Edison Electric Commonwealth Co. of Boston.  
Standardization and Testing Division. O. R. Hogue, chairman. Commonwealth Edison Co., Chicago.  
Research and Sales Promotion Division. Walter S. Byrne, chairman. Nebraska Power Co., Omaha.  
Electric Range Division. J. Paul Clayton, chairman. Central Illinois Public Service Co., Springfield. (Discussion continued from General Session Wednesday morning.)

#### Second Afternoon Session—Thursday, May 20th, 2:30

JOHN G. LEARNED, Chairman  
M. S. SEELMAN, Vice-Chairman  
HENRY HARRIS, Vice-Chairman

Reports: Committee on Electrical Salesman's Handbook. I. Lundgaard, chairman. Rochester Gas and Electric Corp., Rochester, N. Y.  
Bureau of Lighting Sales. Clarence L. Law, chairman. The New York Edison Co., New York.  
Street and Highway Lighting Division. W. T. Dempsey, chairman. The New York Edison Co., New York.  
Industrial Lighting Division. H. H. Magdsick, chairman. National Lamp Works of General Electric Co., Cleveland. (Note: A demonstration entitled "A Demonstration of the New Era in Industrial Lighting," in support of this Report, will be made elsewhere during the Convention.)  
Residence Lighting Division. M. Luckiesh, chairman. National Lamp Works of General Electric Co., Cleveland.  
Division on Light of Large Buildings. G. Bertram Regar, chairman. The Philadelphia Electric Co., Philadelphia.  
Store Lighting Division. F. C. Taylor, chairman. Rochester Gas and Electric Corp., Rochester, N. Y.  
Division on Commercial Aspects of Lamp Equipment. George H. Stickney, chairman. Edison Lamp Works of General Electric Co., Harrison, N. J.  
Discussion of Preceding Reports.



Division Reports: Power Sales Bureau. Economics of the Use of Central Station Electric Power. John W. Meyer, chairman. The Philadelphia Electric Co., Philadelphia.  
 Power Sales Bureau. Electro-Chemical Processes. C. H. McClure, chairman. Commonwealth Edison Co., Chicago.  
 Power Sales Bureau. Industrial Electric Heating. N. T. Wilcox, chairman. Mississippi River Power Co., Keokuk, Iowa.

### Commercial and Electric Vehicle Sections

#### COMMERCIAL SECTION

Third Afternoon Session—Friday, May 21st, 2:30

JOHN G. LEARNED, Chairman  
 M. S. SEELMAN, Vice-Chairman  
 HENRY HARRIS, Vice-Chairman

Report by Committee on Compensation of Salesmen. Adolph Hertz, chairman. The New York Edison Co., New York.

Election of Officers and Executive Committee.

Reports: Power Sales Bureau—Electric Steel Furnaces. Joseph McKinley, chairman. The Duquesne Light Co., Pittsburgh.

Power Sales Bureau—General Power. W. E. Murphy, chairman. Minneapolis General Electric Co., Minneapolis. (This report will consist of a paper by W. G. Taylor, General Electric Co., entitled "Electric Power in the Oil Fields.")

Power Sales Bureau—Power Contract. R. H. Ashworth, chairman. Utah Power and Light Co., Salt Lake City. (This report will consist of a paper, presented by the chairman, entitled, "Standardization of Power Factor Specifications in Power Contract on the Part of Central Station Companies.")

Power Sales Bureau—Isolated Plants. J. B. Stuart, chairman. Public Service Electric Co., Elizabeth, N. J.

Power Sales Bureau—Electric Development. Morse DellPlain, chairman. Northern Indiana Gas & Electric Co., Hammond, Indiana.

#### ELECTRIC VEHICLE SECTION

Afternoon Session—Friday, May 21st, 2:30

GEORGE B. FOSTER, Chairman  
 FRANK W. FRUEAUFF, Vice-Chairman

Address: Section Chairman, George B. Foster. Commonwealth Edison Co., Chicago.

Appointment of Nominating Committee.

Reports: Committee on Legislation. G. A. Freeman, chairman. Walker Vehicle Co., Chicago.

Committee on Standardization. E. R. Whitney, chairman. Commercial Truck Co. of America, Philadelphia, Pa.

Paper: "The Uses and Abuses of Electric Vehicles." H. J. Butler and W. J. Burns, Oneida Truck Co., Green Bay, Wis.

Committee Report: Electric Vehicle and Power Sales Bureau Cooperative. E. S. Mansfield, chairman. The Edison Electric Illuminating Co. of Boston.

Paper: "How the Power Salesman and Electric Vehicle Representative can Help Each Other Get More Business." (Author to be announced.)

Reports: Committee on Garage and Rates. Willis M. Thayer, chairman. The Hartford Electric Light Co., Hartford, Conn.

Committee on Federal and Municipal Transportation. James H. McGraw, chairman. McGraw-Hill Publishing Co., New York.

Committee on Transportation Engineering. F. M. Feiker, chairman. McGraw-Hill Publishing Co., New York.

Election of Officers and Executive Committee.

### Technical and Hydro-Electric Sections

First Afternoon Session—Wednesday, May 19th, 2:30

I. E. MOULTHROP, Chairman  
 H. A. BARRE, Vice-Chairman  
 N. A. CARLE, Vice-Chairman  
 J. E. DAVIDSON, Vice-Chairman

Address: Section Chairman, I. E. Moulthrop. The Edison Electric Illuminating Co. of Boston.

Appointment of Nominating Committee.

Reports: Meter Committee. F. V. Magalhaes, chairman. The New York Edison Co., New York.

Committee on Prime Movers. N. A. Carle, chairman. Public Service Electric Co., Newark, N. J.

Second Afternoon Session—Thursday, May 20th, 2:30

I. E. MOULTHROP, Chairman  
 H. A. BARRE, Vice-Chairman  
 N. A. CARLE, Vice-Chairman  
 J. E. DAVIDSON, Vice-Chairman

Election of Officers and Executive Committee.

Reports: Overhead Systems Committee. W. K. Vanderpoel, chairman. Public Service Electric Co., Newark, N. J.

Underground Systems Committee. F. E. Ricketts, chairman.

Consolidated Gas, Electric Light and Power Co., Baltimore.

Electrical Apparatus Committee. R. F. Schuchardt, chairman.

Commonwealth Edison Co., Chicago.

### MISSION PLAY

It has been arranged so that all of the delegates who attend the convention of the National Electric Light Association at Pasadena in May will receive invitations to attend the California Mission Play. The performance takes place in a unique little theatre constructed to resemble one of the old Missions of California and close by the historic Mission of San Gabriel. It is but a short distance from the Hotel Huntington, the headquarters of the gathering.

Immediately upon receiving their appointments from Convention Chairman Miller, Captain Morphy and Mr. Frost arranged with Mr. John Stevens McGroarty, poet, playwright

and historian, and author of the Mission Play, to produce it at a special performance for the delegates of the convention in order that they may visualize the early history of California by means of its wonderful pageantry, stirring drama and sublime story of the founding of the white man's civilization on the Western shores of America.

San Gabriel and the Mission Play is often referred to as the Oberammergau of Southern California, even though it is vibrant with color and song, and laughter and dancing of the old Spanish times and the romance of the golden days of California. The play is in three acts. The first depicts the heroic struggle and sacrifices of the Southern pioneers to gain a foothold in California, when they founded that mighty chain of Franciscan Missions between San Diego and Sonoma, now lying in ruins along El Camino Real—the King's Highway. The second act depicts the Missions in their glory, while the last tells the sad but beautiful story of the Missions' ruin and the coming of the Gringo.

### CONVENTION VISITORS

Among the prominent electrical men who have already signified their intention of attending the N. E. L. A. convention at Pasadena, May 18th to 22nd, are:

M. S. Sloan, president, Brooklyn Edison Co., Inc., Brooklyn.

D. H. McDougall, assistant to general manager, Toronto Power Co., Toronto, Canada.

Charles L. Edgar, president and general manager, Edison Electric Illuminating Co., Boston, Mass.

William H. Atkins, general superintendent, Edison Electric Illuminating Co., Boston, Mass.

Irving E. Moulthrop, assistant superintendent construction, Edison Illuminating Co., Boston, Mass.

A. C. Marshall, vice-president, Detroit Edison Co., Detroit, Mich.

Frank W. Smith, vice-president, United Electric Light & Power Co., New York.

A. Monro Grier, president, Canadian Niagara Power Co., Niagara Falls, Ontario, Canada.

N. T. Wilcox, sales manager, Mississippi River Power Co., Keokuk, Iowa.

W. N. Ryerson, general manager, Great Northern Power Co., Duluth, Minn.

F. D. Sims, president and general manager, Washington Coast Utilities, Seattle, Wash.

W. E. Mitchell, assistant general manager, Alabama Power Co., Birmingham, Ala.

O. H. Simonds, general manager, Dubuque Electric Co., Dubuque, Iowa.

### N. E. L. A. WORK ENDORSED

The following telegrams were received by President R. H. Ballard of the National Electric Light Association, subsequent to an address recently delivered by M. H. Aylesworth, executive manager of the Association, at the convention of the Oklahoma Utilities Association:

From Mr. T. A. Lane, president, Oklahoma Utilities Association:

"Electric Light Division of Oklahoma Utilities Association heartily endorsed by resolutions in Convention that it affiliate with National Electric Light Association. We appreciate the visit of Aylesworth and the boys agree that he is a real fellow."

From Mr. H. C. Cooper, secretary, Southwestern-Texas Association:

"Aylesworth's talk on National Association made so strong and favorable impression on the Oklahoma Association, as well as on myself as representative of the Southwestern Association, that I would urge as a necessity to both the National and Southwestern that he present it before our May Convention at Galveston."

From Mr. R. B. Schlaggett, president, Mississippi Electrical Association:

"I was present at address given by Aylesworth yesterday before Oklahoma Convention; was delighted with reorganization plans and am going to strongly urge Mississippi Section to remain affiliated with National."

From Mr. Aylesworth:

"Big meeting here went well. Mississippi, Texas and Oklahoma in line."

The program of Geographic Sections as well as the work of the Association as a whole is receiving the heartiest support in all sections of the country.



## NEW ELECTRICAL DEVELOPMENT

(Reports from the Northwest include the establishment of a hydroelectric plant by the Rainier National Park Company and plans for the construction of a \$500,000 municipal plant in Oregon. The Hetch-Hetchy project development stands out among Pacific Central items while news of construction work in Arizona and of the development of power and street lighting come from the Southwest and Inter-Mountain districts.—The Editor.)

### THE PACIFIC NORTHWEST

**YAKIMA, WASH.**—The Pacific Power & Light Company will spend \$30,000 in making improvements to its plant.

**PORTLAND, ORE.**—G. L. Hutchin has been given the contract for fifteen four-horse electric floats to be used in the Shrine convention parade on June 22nd, and in the Rose carnival parade on the 29th.

**SNOQUALMIE, WASH.**—Snoqualmie Falls Lumber Company of this city has ordered through the Seattle office of Allis-Chalmers Manufacturing Company four induction motors for use in its saw mill at this point.

**PORT ANGELES, WASH.**—The Zellerbach Paper Company has awarded contract and started excavation for its extensive paper mill at this place. Westinghouse Electric & Manufacturing Company has been awarded the contract for the electrical equipment.

**BLAINE, WASH.**—Chief Engineer Eddy, and General Freight and Passenger Agent W. D. Power, both of the British Columbia Electric Railway, were here recently to confer with local people regarding the extension of the company's line from Cloverdale, B. C., to this place.

**ROSEBURG, ORE.**—Acting on the reports of Mayor Hamilton and Engineer E. Summers, the city council has taken steps necessary to place the proposal for a \$500,000 bond issue before the voters for the purpose of constructing a municipal power plant at Whistler's Bend and a municipal light and water system in the city. The election will be held in May.

**SEATTLE, WASH.**—The figures upon which the city proposed to base negotiations for the purchase of the Seattle & Rainier Valley Railway have been submitted to the city council utilities committee by Councilman W. H. Moore. The amount is \$765,750. E. W. Sampsell of Chicago, president of the company, refuses to negotiate on the basis of Councilman Moore's report.

**CHINOOK, ORE.**—That this place will solve the problem of the minimum cost of electric lights is assured. The Commercial Club is agitating the matter. It is proposed to organize a stock company locally and petition the fisheries department to increase the size of the proposed pipe line from six inches to 10 inches, the added expense to be borne by the company. The company would then install a turbine. It is also proposed to build a reservoir on the Chinook river which would insure service during the dry months.

**KLAMATH FALLS, ORE.**—The California-Oregon Power Company is ready to relinquish its contract with the United States government for the building of the Link river dam, which includes provisions for the storage and distribution of power and irrigation water supply in the Upper Klamath lake, on assurance that the government will build the dam at once. This is according to a statement of George J. Walton, local superintendent of the company, at a conference with water users and American Legion representatives here.

**PORTLAND, ORE.**—At the annual meeting of the Northwestern Electric Company reports were given which showed that the gross receipts of the company have increased over the same period in 1918 by \$270,554, or 26 per cent, and the net profits increased \$85,268, being an increase of 32 per cent over 1918. The net

profit of \$354,400 for the year 1919 is more than three times the preferred stock dividend, and after deducting the dividends paid on preferred stock of \$112,218 there is a surplus remaining from the year's operations of \$242,182, which makes the total earned surplus to December 31, 1919, \$742,933.

**PORTLAND, ORE.**—The recent controversy between the Klamath Falls post American Legion and the California-Oregon Power Company regarding the disposition of the water of the Klamath river and the water of upper Klamath Lake, in connection with the leasing of the surrounding land to Doak and Brown for a long term of years, has been settled by the passing of a compromise resolution asking Congress to appropriate funds for the completion of the Klamath irrigation project according to original plans. This provides for the irrigation water for 250,000 acres of land being insured before the same is made available for power purposes.

**SEATTLE, WASH.**—Thompson & Castleton, Inc. are installing a 400-kva. steam turbo generator set for the N. Campbell Shingle Company at Ballard, together with ten 25-hp., 1800-r.p.f. motors and a number of smaller motors for driving shingle machines. They recently electrified the plant of the Central Sand & Gravel Company, three miles beyond the city limits of Seattle, current to be supplied by the city lighting plant, and are also replacing the distillate engines in the Beauclaire Packing Company's plant at Port Beauleur, Washington, with motors, including two 30-kw. generators driven by semi-Diesel engines, and a number of smaller motors. This step was taken because of the removal of distillate from the market.

**VALE, ORE.**—J. Edwin Johnson of this place has filed with the state engineer at Salem, an application for permit to appropriate 100 second-feet of water from the middle fork of the Malheur river to be used in developing 35,444 theoretical horsepower. The diversion works will include a concrete dam five feet high, 60 feet long at the top and 40 feet at the bottom with waterway and concrete headgate with two openings. Water will be delivered from the forebay to the power house through two penstocks. Power will be generated by turbine water wheels and will be used in pumping water for irrigation in Harney Valley and for municipal purposes. The work is to begin one year from date of permit and will be completed in three years, at an estimated cost of \$350,000.

**TACOMA, WASH.**—The Rainier National Park Company, which built some large tourist hotels in the Park recently, is establishing a hydroelectric plant on Paradise Creek. This will comprise a 400-kva., 2300-volt, 60-cycle, three-phase horizontal alternator direct connected to an impulse wheel for operating under a head of 500 feet. The power will be used for supplying light and heat to the various hotels and camps in the park. The guests' rooms at the hotels will be provided with electric heaters and several hundred of them will be used. The power will be transmitted by step-down transformer located to serve Paradise Inn in Paradise Valley, as well as the hotel at Longmire Springs. The entire equipment is being furnished by the Allis-Chalmers Manufacturing Company through the Seattle office, including hydroelectric unit, gate valve and transformer. The installation is being made by Thompson & Castleton, Inc., of Seattle.

### THE PACIFIC CENTRAL DISTRICT

**SAN FRANCISCO, CAL.**—The Railroad Commission has instituted an investigation into the matter of the construction and operation of electric utilities and the disposition and transfer of electricity during the present emergency created by the abnormally low precipitation. A public hearing was held before the commission on March 24, at the commission's offices.

**SAN FRANCISCO, CAL.**—The Western States Gas and Electric Company, which operates in Stockton, Richmond and Eureka, has been authorized by the Railroad Commission to issue \$603,000 par value of its 7 per cent cumulative preferred stock. The order provides that the company shall use \$454,600 of the proceeds of the stock sale to meet sinking fund payments. The balance is to be used to pay for construction work.

**OAKDALE, CAL.**—Recent arrivals from the mountains say there is more water on the Stanislaus watershed than in several years. The recent rains in the valley were accompanied by snow in the hills. Many irrigation men look for a better irrigating season this year than last, and if there is the usual cool spring, it is believed there will be water until August.

**RICHMOND, CAL.**—A movement in Richmond to have all electric wires placed underground is to be first acted upon by the Pacific Telephone & Telegraph Company, according to information given to the city council by the fire chief. He asked, in connection with the action, what disposition the council wished to make with regard to the fire alarm wires which are now carried on the telephone poles. The matter was referred to the fire chief and the fire committee. The fire chief objects that the telephone company's action, which would start on Macdonald avenue, would probably be followed by other companies having electric wires, so that the only poles left standing would be those of the street car company.

**MODESTO, CAL.**—The directors of the Modesto Irrigation District have engaged John Francis Neylan of San Francisco, former chairman of the State Board of Control, to settle their dispute with Turlock over the appointment of a chief engineer at the Don Pedro dam. Mr. Neylan has promised to submit a definite plan of operation which will be acceptable to both districts.

**ALTURAS, CAL.**—The election in the Hot Springs irrigation district in this county resulted in a unanimous vote in favor of issuing \$100,000 worth of bonds. The district was recently organized. Thousands of acres will be irrigated when the reservoir known as the Big Sage Reservoir is constructed.

**SAN FRANCISCO, CAL.**—April 21st is the date set by the board of public works to consider bids for the construction of aqueduct tunnels in the mountain division of the Hetch-Hetchy project, under Contract No. 77, specifications for the work having been completed by M. M. O'Shaughnessy, city engineer. The contract covers the portions of the aqueduct between Early Intake and Priest Portal, a distance of 18.3 miles. Provision is made in the specifications and proposal for a division of the work into two sections, if such division be found to be to the best financial interests of the city. The divisions are as follows: Contract 77A—Covering the aqueduct between Early Intake and the south



fork of the Tuolumne river, 4.5 miles; Contract 77B—Covering the aqueduct between the south fork of the Tuolumne river and Priest Portal, 13.8 miles. Bonds for the work have been fixed as follows: Contract 77, \$800,000; Contract 77A, \$200,000; Contract 77B, \$600,000. In accordance with the requirements of the city charter, an additional bond in the sum of not less than one-half of the total amount payable by the terms of the contract is required.

**REDDING, CAL.**—The Happy Valley Irrigation District sold \$100,000 in 6 per cent bonds to Stephens & Company of San Francisco at 97.3 and accrued interest. This is the last of the block of \$615,000 originally voted. The directors report that they will have plenty of money to complete the system. The Messelbeck dam, which makes a great storage reservoir, was completed, thus assuring plenty of water for Happy Valley for this season. The reservoir holds 5000 acre-feet of water.

**RIVERDALE, CAL.**—The Riverdale irrigation district will hold an election of directors on April 10th.

**GRASS VALLEY, CAL.**—The Brandy City gravel mines on north Yuba river, with water development and concrete dam of the Marysville-Nevada Water and Power Company, have been sold to Bulkeley Wells and associates.

**GRIDLEY, CAL.**—Engineers representing the Pacific Pipe Company of San Francisco arrived in Gridley to commence the survey for a gas manufacturing and distributing plant for this city.

**VACAVILLE, CAL.**—The Vacaville Water and Power Company has filed a suit against the Pacific Portland Cement Company asking a judgment in amount of \$25,000 as damages and that the defendant be restrained from carrying or taking any water from certain basins near Vacaville.

**RIVERDALE, CAL.**—Adopting a resolution establishing the boundaries of the district, the board of supervisors has fixed April 10 as the date for the election of the new Riverdale irrigation district. Three directors and one other officer, holding the consolidated post of assessor, collector and treasurer, are to be voted for.

**COLUSA, CAL.**—By filing with the supervisors a petition signed by three-fourths of the property owners, the Williams Irrigation District has gone over the head of State Engineer W. F. McClure and obtained the approval of the supervisors for the legal formation of the district. State Engineer McClure refused to endorse the district, which is designed to irrigate 10,000 acres for rice, due to the water shortage. He pointed out, however, that the district could go over his head by a majority of signatures.

## THE PACIFIC SOUTHWEST

**BRAWLEY, CAL.**—The Oakley Company has been authorized to have work proceed at once on the extension of water plant, new reservoirs, ditches, etc.

**LOS ANGELES, CAL.**—An ordinance has been passed granting the Pacific Electric Railway Corporation a franchise to construct and lay a single railroad spur track on Santa Monica Boulevard, etc.

**LOS ANGELES, CAL.**—A plan is under consideration for the extension of the Stephenson Avenue street car line to Fourth Street Bridge and to connect Traction Avenue and Second Street to take care of East Side traffic.

**CLIFTON, ARIZ.**—Greenlee County Water Users' Association contemplates the erection of a diversion dam on the upper Gila River which would reclaim several thousand acres of new land in the Duncan Valley. F. J. McGrath of Franklin is president of the association.

**EL CENTRO, CAL.**—The Imperial Irrigation District Board of Directors contemplate calling a bond election for at least \$9,000,000, to provide funds for building the Laguna Dam to Hanlon's, as the first initial step toward the construction of the All-American Canal.

**EL CENTRO, CAL.**—The city council has decided to place proposals to issue \$190,000 bonds for reconstruction of the municipal water reservoir at New River, \$31,900 for ornamental street lighting, and \$15,000 for an automatic fire alarm system, on the ballot at the city election April 12th.

**OJAI, CAL.**—The Sespe Light & Power Company is putting in a power plant on the Sespe river near Hot Springs, and has filed plans for financing construction costing \$1,000,000 by the issuance of first mortgage bonds and \$1,000,000 capital stock. Four dams are to be constructed, three conduits and three power plants.

**ONTARIO, CAL.**—Ontario Power Company, which sells electric energy in the cities of Ontario and Upland, San Bernardino county, has applied to the Railroad Commission for authority to issue \$74,000 par value of its 7 per cent preferred stock. The proceeds are to be used to discharge notes aggregating \$24,000 and to finance, in part, improvements that have been made to the company's system.

**PHOENIX, ARIZ.**—Reconstruction of most of the overhead electric work done throughout Arizona became a possibility recently when an appeal was filed in the state supreme court by the Pacific Gas & Electric Company, of Phoenix, against the state of Arizona. This was an appeal from a decision of the superior court of Maricopa county on an action against the Pacific Gas & Electric Company which was, in effect, a test of an initiated law to govern overhead electrical construction, and by virtue of which decision a small fine was imposed on the company.

**LOS ANGELES, CAL.**—The Southern California Edison Company has elected the following officers, and their duties are now fixed to provide for the necessary substantial increase in power development and to facilitate the operation of their greatly enlarged business: John B. Miller, chairman of the board of directors and president of the corporation; W. A. Breckenridge, senior vice-president, in charge of power development; R. H. Ballard, vice-president and general manager; G. C. Ward, vice-president, in charge of operation and construction. General superintendents, construction engineer, electrical engineers and right-of-way agent will report to Mr. Ward; A. N. Kemp, vice-president and comptroller, in charge of finance and accounts. The treasurer, auditor, purchasing agent and general storekeeper will report to Mr. Kemp; S. M. Kennedy, vice-president and general agent, in charge of business development and personal relations; A. E. Morphy, secretary; W. L. Percy, treasurer; and R. V. Reppy, general counsel, in charge of local affairs.

## THE INTER-MOUNTAIN DISTRICT

**EUREKA, UTAH.**—This city has granted a renewal of the franchise to the Utah Power & Light Company.

**SALT LAKE CITY, UTAH.**—Electrical interests of this city are conducting a campaign to educate the public to the value of convenience outlets for the use of various devices. The newspapers are offering splendid cooperation to put this idea across.

**WASATCH, UTAH.**—To generate power for power and lighting at this place, the Whitmore Oxygen Company of Salt Lake City has applied to the state engineer for permission to divert thirty second-feet of water from Little Cottonwood Creek, Salt Lake County, the water to be carried through a flume and pipe line a distance of 6250 feet.

**DENVER, COLO.**—Directors of the General Electric Company have authorized the offering of new stock to present shareholders at \$125 a share on the basis of one share of new for ten shares now held. Holders of record April 6th were given the privilege of subscribing, the expiration date being May 20; payment for the new stock being required to be made on or before that date.

**FALLON, NEV.**—Stating that a deficit of \$191,714 has been incurred on the Newlands project between 1918 and 1919, Director A. P. Davis of the United States Reclamation Service has written to the president of the Truckee-Carson irrigation district, suggesting plans for retiring the debt. The president prefers an added tax for operation and maintenance of \$28,757 paid annually until the debt is wiped out.

**DOUGLAS, WYO.**—The report of the findings of the Wyoming Public Utilities Commission upon the complaint of the town of Douglas against the Douglas Electric Light Company has been received by the mayor. The findings as a whole give the city a reduction in rates. The chief point won by the city was in the reduction of the pumping rate from 7½ cents to 4 cents per kw. This will mean a big saving to the city in the course of a year.

**FORT MORGAN, COLO.**—Supervisor Glenn White has completed a map of Morgan county which easily surpasses any map ever produced in this section. After many months of work the map is now ready for distribution and is most favorably spoken of by all who have inspected it. The location of the towns, streams, irrigation systems and boundaries are shown with an accuracy that makes it reliable for deciding locations and boundaries not heretofore enjoyed in access to a map.

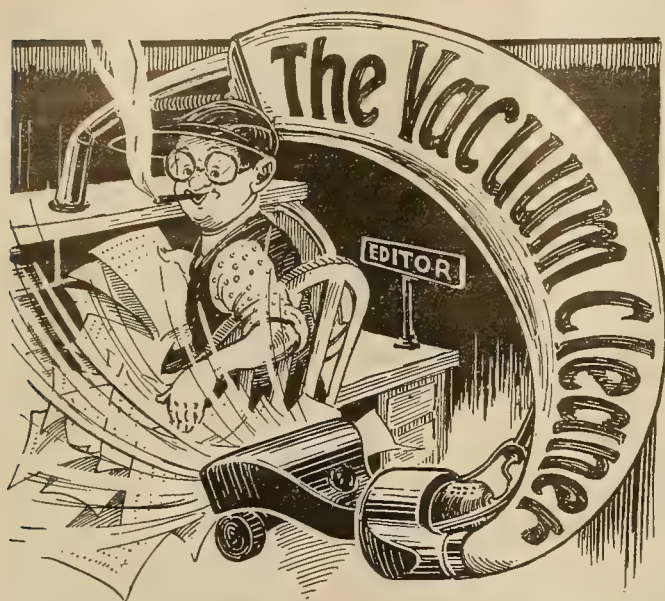
**COLORADO SPRINGS, COLO.**—It will be up to the city electrician to install the ornamental lights on Pike's Peak avenue from Nevada avenue to the Santa Fe station, inasmuch as no bids were received for the installation of the lights by City Clerk Ewing. The ordinance creating the new lighting district went into effect on March 16. At the first reading of the ordinance, the city clerk was instructed to advertise for bids. It will be necessary for the city electrician to enlarge his force of men for this work.

**PUEBLO, COLO.**—Ground will be broken about the middle of April for the new 10,000-horsepower electric generating station of the Arkansas Valley Railway Light and Power Co. Construction will be pushed as rapidly as possible, for the large brick and steel building must be ready to house the generating equipment and boilers when the latter arrive. By the time the new powerhouse is completed a large part of the energy which it will produce will be needed by the growth of the demands upon the company for power, lighting and heating, it is thought.

**DUGAN CITY, COLO.**—The committee of fifteen appointed by the Chamber of Commerce to investigate and make recommendations in the matter of proposed electric power possibilities, has made its report to the city council. This report, which was read at a special session of the council, bears the signature of all members of the committee. The committee favors the recommendations of George G. Anderson, the Los Angeles, Cal., engineer, looking toward municipal ownership of the power resources of the region. Also it asks the city officials to finance additional surveys pertaining to possible developments on the south slope of Pike's Peak.

**LOVELAND, COLO.**—Suit was filed in district court at Fort Collins recently by the city of Loveland to condemn the property of the Western Light and Power Company in Loveland for the purpose of the projected municipal electric plant. This suit carries out the intention of the city council recently announced after negotiations for purchase of the property by the city had failed. The suit is directed against the power company as owner and the Franklin Trust Company of Philadelphia, trustee for the bondholders, and seeks to take for the public use the real estate, electric sub-station, transmission lines, and all appurtenances pertaining to the company's distribution system in the city of Loveland.





The mark of a wise man is to recognize a good thing when he sees it. We don't know the canny Scot who wrote the following tribute, but we think he has the mark of a wise man:

If it delights ye  
Fir tae cast yir een  
Ontae a lad  
Thot juist fair radiates  
Satisfaction  
Wi' things as they are  
Ye suld hae been wi' me  
Day afore yesterday  
Recht efter the braw rain  
When I met oop  
Wi' this here lad,  
A. G. Wishon,  
The high muck-a-muck  
O' the power company.  
He wes cumin' doon  
The sidewalk on J street  
And he wore a luik  
On the face o' him  
Thot wuld hae tempted me  
Fir tae ask him  
Fir tae lend me ten dollars  
Till pay day cum around  
If it hedna been  
Thot I'd juist tapped  
The pocket-buke  
O' the gudewife  
Afore I left the hoose.  
He wore a smile  
Thot resembled the smile  
Thot ye'll see  
On an auld tabby-cat  
Recht after she's caught  
A wee bit mousie  
And played wi' it  
And made a meal aff it  
And finished oop  
Wi' a saucer o' cream.  
Satisfaction wes there  
And real couthy joy  
And goblets o' gledness.  
There wes a noise  
Oot on the street  
Frae a coople o' flivvers  
Sae I culdna tell  
If he wes purrin',  
But I make nae doobt  
That he wes  
And I'm convinced,  
Frae the general luik  
O' happiness about him,  
That the verra minute

He got intae his office  
And got the dure shut  
And telt the office-lad  
No tae disturb him  
Thot he licked his paws  
And washed his face.  
Mon-o-dear folk,  
But he wes pleased  
Wi' ilkathing  
And ilkabody.  
The drouth wes broken  
And the rains hed fallen  
And snows hed cum  
In the high mountains  
And in the een  
O' this here lad  
Ye culd see the reflection  
O' the great rainbow  
O' pleasant promise  
Fir mair water  
Tae fill mair dams  
Tae make mair power  
Tae water mair acres  
And licht mair lichts.  
I'll juist bet ye  
That if I'd stapped him  
And stroked him gently  
He'd hae crackled  
Wi' electricity.  
It's a cheerin' sicht  
Fir tae lay yir een  
On sic satisfaction.  
It warms oop  
The cockles o' yir heart  
And puts jazz  
Intae the blude o' ye  
And ye lift yir feet  
A bit mair hastily  
And set them doon  
Wi' mair firmness,  
"A's weel wi' the world"  
The lad seemed tae say  
And his smile proved it  
Till ilkabody he met  
Fell in line wi' him  
And smiled wi' him  
And were happy  
Thot the rains hed cum  
And the snows descended.  
Yir Frien',  
SCOTTY.

\* \* \*

Power shortage would seem to be due to Nature overhearing our "stop spending" slogans, if the dictum of a certain rural oracle counts for anything. The aforesaid oracle was answering the torrent of eager questions put to him by the returned soldier, who had been away from the little town for three years.

The soldier, checking up familiar landmarks, had just missed something.

"Where's Hodge's other windmill?" he asked in surprise.  
"I can only see one mill, and there used to be two."

The native gazed thoughtfully around as if to verify the statement. Then he said, slowly:

"They pulled one down. There weren't enough wind for two of 'em!"

\* \* \*

A common commercial language would seem to be a 'safety-first' measure as well as the other things its advocates claim for it. The following story, which, by the way, comes to us from someone who asserts that Minnesota is a Pacific Coast state, illustrates the dangers of a private vocabulary in inter-state commerce:

W. T. Richardson, one of the Western representatives of the electric cleaner division of the Torrington Company, has a small son who, at the early age of two years, coined the word "boo" for vacuum cleaner. The small son is now six years old but the word boo is still current in the family. Recently Mr. Richardson after an especially successful day telegraphed the wife and boy thus:

"Sold \$12,000 worth of boos today."

The telegram fell under the watchful eye of the government drink sleuths and immediately the hotel quarters were raided in search of the forbidden liquid.

We have it on good authority that the search was fruitless, but Mr. Richardson proposes to revise even his family vocabulary to conform to constitutional amendments when using the telegraph system.

\* \* \*

If it weren't for parents, children might know something about electricity. Little Willie said to his father:

"Father, what is that little wire tied to the big one for?"—pointing to the stranded-iron messenger wire supporting the lead-covered telephone cable.

"That, my son, is to keep the birds from standing on the big wire and getting shocked."

\* \* \*



#### HELPFUL HINTS TO THE METER MAN—No. 3

It takes nerve to calmly read a meter with some ferocious animal threatening to bite, mangle or devour one. Of course it is true that many a dog's bark is worse than his bite, yet, if the meter man wishes to maintain perfect composure of mind throughout his expedition he should adopt this latest in uniform suggestions. Furthermore, this type of suit would do away with the regular wear and tear on clothing, and it also might tend to distinguish the meter man from all other household visitors.



# JOURNAL OF ELECTRICITY

VOL. 44 NO. 8

SAN FRANCISCO, APRIL 15, 1920

PER COPY, 25 CENTS



**T**his is our Ontario factory which with additions and improvements is now capable of turning out 10,000 finished appliances per week.

## EDISON

Such an output will go a long way toward satisfying consumer demand. The Pacific States Electric Company is ready to cooperate with the dealer trade in an effort to keep your Edison stock complete. As fast as your Edison appliances are sold replace them with more.

Edison turnover is rapid!

Aggressive advertising is stimulating the consumer demand. In an effort to meet it we have doubled our capacity by enlarging both our Chicago and Ontario plants.

Edison Electric Appliance Company, Inc.

CHICAGO

New York

Ontario, California

Atlanta

*Pacific Coast Distributors*

**PACIFIC STATES ELECTRIC CO.**

San Francisco

Los Angeles

Portland

Oakland

Seattle

Spokane



A New Addition to the "MAJESTIC" Line

# "MAJESTIC" No. 11

A Sure Winner

A chill-killer, a glow-bringer, a comfort-maker



Showing the steel back of "Majestic" No. 11, always cool, therefore danger-proof.

Showing the removable wire guard which is easily taken off, making the cleaning operation a simple one.

## "MAJESTIC" No. 11 — The Heater That Defeats Winter

### Dimensions

Height .....	19¼ inches
Diameter .....	14½ inches
Weight .....	7½ lbs.
Shipping weight .....	10½ lbs.

### Equipment

8-foot heater cord with separable attachment plug. Heating element guaranteed for one year. Reflector pure copper burnished.

There are, besides "Majestic" No. 11, six other styles of "Majestic" portable heaters and three stationary, or insert types

## "MAJESTIC" ELECTRIC DEVELOPMENT CO.

Manufacturers and Patentees

KANSAS CITY

SAN FRANCISCO

PHILADELPHIA

"MAJESTIC" Electric Heaters——Best in Creation for Heat Radiation



# JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

VOLUME 44

SAN FRANCISCO, APRIL 15, 1920

NUMBER 8

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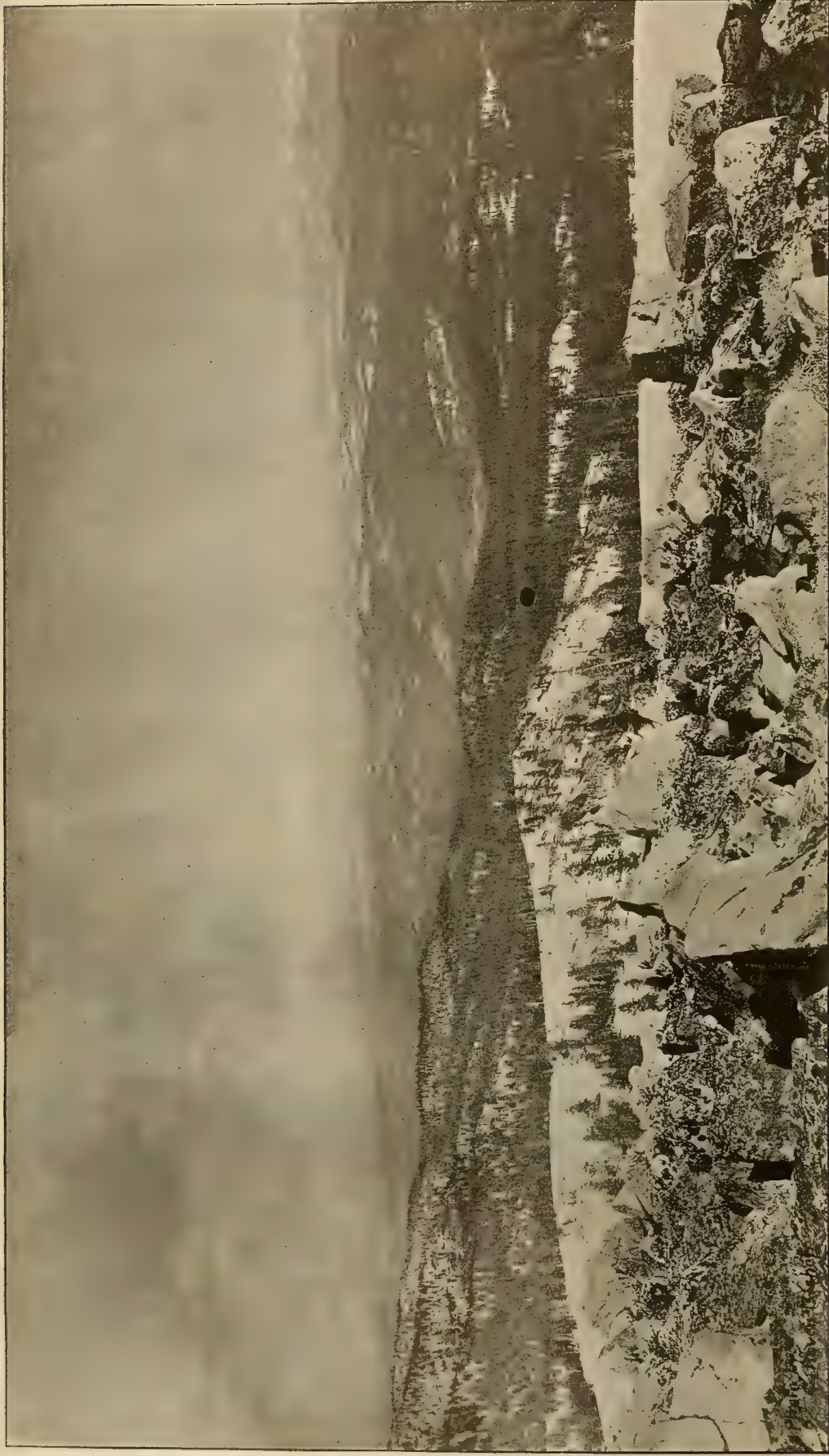
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## *The West, a district of vast demand for hydroelectric power*

Statistics are being compiled from an accurate survey that is now just completed wherein data has been furnished by the 52 major power companies of the West which will show by chart and diagram a situation in power demand for the next ten-year period in the West that will almost stagger the imagination. The details of this investigation will appear in the Journal of Electricity for May 15, 1920.

The vast sums of money necessary for this work will be forthcoming from the public itself, due to the self-interest appeal that has so successfully been launched by the Pacific Coast Section, N. E. L. A.

The view shown is that of the Big Creek System of the Southern California Edison Company which proposes a development scheme that will bring to the perpetual service of our citizens a total of 643,000 kw. of installed capacity representing an additional invested capital of \$128,000,000, not including transmission and distribution costs.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, APRIL 15, 1920

Number 8

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## *Pacific Coast Section N.E.L.A. and its Accomplishments*

**T**HE PACIFIC SECTION N. E. L. A. occupies a unique position in the industry today. As a geographic section of the National Association it has by far the most intensive membership per capita of population existing anywhere in the nation, and yet, in spite of vast distances involved, this section has made possible, or at least contributed a substantial part of the work in the establishment of an electrical cooperative idea that has cemented all branches of the industry into one harmonious whole, which is today increasing the economic distribution of electrical supplies and aiding effectively in creating a better understanding between the public served and those having this duty to perform. Not only has it paved the way for vast interconnections of electric service, thereby contributing an economic advantage to the industry in the West, but it has also had a leading and effective part in countless other engineering and merchandising problems of the West. Far and away above all other considerations, however, this year's activities have placed the Pacific Coast Section N. E. L. A. as a distinct leader in thought in the industry.

The development of the Self-Interest idea is generally acknowledged by all to be the most constructive new conception that has appeared upon the electrical horizon during the current year. Members of regulating bodies, central station executives, financiers, publishers, and the public at large have come to view the electrical industry with a new and clearer meaning, a meaning full of significance to their own individual prosperity and happiness by the development of this unique idea of self-interest. It is, as a consequence, not too much to say that this year's activities of Pacific Coast Section N. E. L. A. will go down in history as the most constructive of all the years in the eventful life of the electrical industry, not only on the Pacific Coast but also in the nation at large. And this contribution will undoubtedly have more to do with the solving of the difficult question of finance that today faces the industry in its efforts to bring about new power development than any other one thought that can be brought to bear upon its solution.

The report of eleven San Francisco jobbers on the increase of sales during 1919 over 1918 presents some very interesting facts that may be briefly noted. The largest increases were in washing machines with 184.5%, drink mixers 176%, ironers 140%, water heaters 131.4% and vibrators 126%. The other appliances which increased over 100% were vacuum cleaners, percolators, miscellaneous irons, laundry and tailor irons, air heating radiators and ranges, while the lowest items on the list were fan motors, air heaters less than 600-w. and lamp socket ovens, the average increase being over 62%.

This list should be studied by the jobbers, contractors, and dealers, for it furnishes information from which progress charts can be made which will determine just what lines need pushing and where

the fastest turnovers can be made. The fact that the items at the bottom of the list are all of small wattage and those at the top of the list the greatest consumers of current, illustrates very forcibly how the cooperative campaign which made possible these phenomenal increases has benefited all who are taking part in it.

If the increase of last year over 1918 is taken as an example of what can be done by cooperation the increase during this year will be still greater on account of the ever-increasing quantity of work being done to provide outlets for these appliances. While in the past all branches of the industry in the West have been hammering away at the cooperative plan they have been able to give no concrete figures or examples to the doubting Thomases, but with the conclusive proofs such as are represented it should convert even the most conservative. It is another

HERBERT HOOVER says: "Don't run for president if it interferes with your attendance at convention."



triumph for the West and for the California Electrical Cooperative Campaign, which has done such splendid pioneer work.

It is interesting to notice how far the self-interest appeal is reaching both within the industry and without. The past month has seen a number of notable advances. Throughout the East, W. L. Goodwin in his various speeches before central station and contractor-dealer gatherings is urging that the individual invest part of his earnings in central station securities. At the recent convention of the Pacific Division of the National Electrical Supply Jobbers Association, forceful discussion was brought out as to how the jobber may better assist in this financing of utility securities, by urging upon their employees investment of their earnings. Members of Railroad Commissions of the West are likewise formulating in mind as to how the public at large may be better interested in assisting the utility in finance, even to the putting over of drives similar to the Liberty Loan and other vast activities of this sort.

No matter how the problem may be eventually attacked, this is known and fully realized at the present—that it will be eventually successful and complete, for the need of hydroelectric energy is beyond the question of a doubt necessary in the development of the great West. And when the citizenship at large become more firmly convinced of this, nothing can stop the impetus of the movement towards firm and successful financial status and achievements.

An important service has recently been rendered by the Joint Committee of the Technical Societies of Los Angeles in the publication of a group of papers brought out at a recent meeting devoted to the subject of industrial lighting, reprinted together with an article on the same subject from the Journal of Electricity. The peculiar advantage and value of the joint organization is to be seen in the scope of these papers, which cover the subject from the standpoint of the architect and factory engineer, as well as from that of the electrical expert.

The compilation has been printed and sent to industrial plant managers throughout Southern California—an example of practical cooperation and civic service, which is characteristic of the more active part engineers are taking in the welfare of their communities. The joint organizations which have been organized to meet local engineering problems in the various districts of the West have become the center of this more enlightened attitude, a contribution which alone would justify their existence.

The paper referred to is that of Frank Fagan which is to be discussed at the forthcoming convention of the Pacific Coast Section N. E. L. A. Of equal importance is the paper of Garnett Young on the necessity for more convenience outlets in the home. Both papers appeared in the Journal of Elec-

tricity February 15, 1920. Great good can be done in forwarding the electrical industry by promoting similar civic service discussions on the part of technical and engineering societies throughout the West in which better lighting and more educative enlightenment on the need for more convenience outlets in the home shall be given prominence.

During the sessions of the last Congress, the Journal of Electricity devoted some space to the importance of legislation then pending for the increase of salaries and of personnel in the Patent Office. In the rush of congressional business, the bill did not receive attention and a similar measure has recently been introduced in the House under the number H.R. 11984 for the consideration of this Congress. The value of efficiency in the Patent Bureau to an industry so dependent upon patents as the manufacturing branch of the electrical industry is apparent. The present bill is aimed to correct the inevitable tendency to cut down on appropriations for this work when the bureau forms only part of the general budget of a government department. This legislation has been approved by the Engineering Council of the National Engineering Societies and deserves the active support of individuals and local engineering bodies alike.

Much interest is being manifested among all elements of the electrical industry throughout the nation in the 1920 advertising drive of the California Electrical Cooperative Campaign. The magnitude of this plan, involving the regular inclusion of distinct electrical pages and sections in practically every newspaper of general circulation in the state, makes it truly noteworthy. It is as a consequence of timely interest to review recent activities along this line. At the outset it is well to remark that there is nothing revolutionary in the project—there will be no sudden overturning of established advertising policies as built up by the power companies individually through many years of constructive effort. Instead, there is sure to be an upbuilding of profitable publicity on the basis of what has already been done.

The central stations are in all cases consulted in the working up of special electrical sections within their respective territories. When the advertising field representatives of the Campaign forces plan the organization of these "sections" in any part of the state, they first consult the executives of the power companies there. The relations of the companies with other elements of the electrical industry within their territory thus remain undisturbed, yet the Campaign organizers are enabled to build on the friendly associations that have been already established and at the same time to secure new and favorable contacts with the public. The nucleus of the electrical section is usually the large advertisement of the central station, and the contractor-dealers are strongly urged to "tie-in" with the general publicity



idea conveyed. This plan is already in actual operation and is found to work out well.

In regard to prepared publicity matter, also, the established policy of the power company is respected. The material is sent to the offices of the companies, for distribution throughout their territories as they see fit. It is suggestive merely, and they are free to use it as a basis for news items and notes on the industry. The publicity managers and local agents of the power companies see that the publicity is properly supplied to those newspapers having special electrical advertising pages.

The whole skilful plan of campaign is well worthy of consideration, and no feature more so than the recognition of the primacy of the power companies in publicity relations.

The appointment of W. B. Greeley, formerly of California, as chief forester of the United States

#### The New Forester

Forest Service is of timely significance to the electrical industry. Mr. Greeley comes to his new office with a backing of many

years of technical service to the nation, in which he has on many occasions exemplified unusual skill. The manner in which he handled the record-breaking forest fire of 1910 in western Montana still stands forth as a national achievement. Later in organization of the engineers of the forestry service, who served so valiantly in France, he exemplified this same ability as lieutenant-colonel, having under his command some nineteen thousand men. But not alone in technical skill is Mr. Greeley pre-eminently qualified for the position, but the exceptional vision he has acquired from early youth looking to the development of the vast water power resources of the nation, coupled with the practical utilization of our national forest resources, makes possible an unusual setting for future usefulness to the electrical industry.

The policies and accomplishments of Mr. Greeley as head of the United States Forest Service will be watched by the electrical industry, as a consequence, with the keenest interest.

One of our Western agricultural colleges has announced a course in electricity for young women

#### Electrical Training for Women

which will teach the repair of the ordinary household appliances. Among the subjects are the location and replacement of blown

fuses, the repair of broken appliance and lamp cords, care and simple repair of washing machine motors, care and operation of home lighting plants, and other problems that are apt to arise.

This is a subject that should be taught in all of the colleges, for with the great increase in the sale of appliances, the majority of which are used by the lady of the household, some knowledge of the care and maintenance of these appliances should be taught her. It would lead to a better understanding of the possibilities and limits of the various appli-

ances which with better treatment would last longer. Such a course of study would not only be beneficial to the women but also to the power company and the contractor-dealer; for, realizing the possibilities of all of the appliances, there would be more sold and more current used. The contractor-dealer does not care for the business which calls for a half-hour's trip each way to replace a burned-out fuse. The cost of the fuse is not enough to compensate the dealer for the time consumed in making the trip and if he charges enough to cover his time, he leaves behind him a dissatisfied customer who firmly believes him to be a lineal descendant of Captain Kidd.

Such a course could well be adapted to high schools, for with the assured success of the cooperative plan which is now sweeping the West, every home in the West will soon be an electrical home in the true sense of the word. An educational campaign would do away with the timidity which most women have regarding electricity and restrain a few of the bolder souls who, thinking that electricity having been put to work is harmless, by their ignorance bring a lot of unjustified censure upon the industry.

Price fixing by trade and merchants' associations bears a very black reputation in the mind of

#### Price Fixing and Public Good Will

the public. The prejudice in many cases is wholly unfounded—for the uniformity of schedule established by a central or-

ganization is undoubtedly more often intended to bring up the standard of workmanship of the unscrupulous price-cutter than to obtain any unwarranted margin of profit on work which is legitimately done. So long as such transactions are genuinely intended to result in public benefit they carry their own safeguard and are a legitimate province of organizations which are established to improve the standards of their respective industries. Such matters, however, have a way of inevitably coming home to roost—and any tendency toward price fixing which would take advantage of a monopoly, could prove of only temporary profit.

The electrical industry has recognized the short-sightedness of the purely selfish attitude in business and has adopted principles which make it possible for the California Electrical Cooperative Campaign to place at the head of its communications "Better Service to the Public," and for the power companies and contractor-dealers to state and to believe that "He profits most who serves best." A far-sighted business man recently set forth the idea before a gathering of electrical merchants that improved methods of manufacture and merchandising should bear their corresponding reductions in price to the public and that any industry is in a safe and healthy condition only in proportion as the public is receiving the benefit of its constructive thought. It is the recognition of this attitude by the public which has given the electrical industry the firm position in the public good will which it is coming to hold.



We view with considerable concern the desperate conditions among engineers in Vienna, Austria. It is true that these men are in the enemy country, and yet not only for the sake of humanity but put it, if you will, on the dollars and cents basis, it is to our interest that every possible and reasonable aid be given them. Before 1914 one dollar was equal to less than five Austrian crowns. According to recent exchange notes, two hundred and sixty to three hundred crowns are necessary for the purchase of one dollar. It is readily seen that such an exchange rate makes it impossible to buy food from America. As a consequence, the prices for food are now a hundred fold increased; for clothing they are thirty times higher; and the price for coal two hundred and fifty times higher than in 1914. Austria in its present shrunken size does not produce sufficient food. The country is cut off from its former sources of wealth, from all coal mines and agricultural districts. Thousands of poor children and weakened men must die of tuberculosis.

It is well that we think seriously on these things, and see if something cannot be done to soften the situation.

At such a time, when the shortage of water and necessarily the shortage of power in the West is a pressing question, the spirit of the West shows itself in the optimism with which all of the power companies are going ahead undaunted, making plans for more extended hydroelectric developments than ever before considered and taking advantage of the education given the people in investing by the many Liberty Loan drives, by offering additional stocks and bonds to carry on the work contemplated. The faith of the people of the West in the West is shown by the fact that the individual consumer of the company's power is fast becoming a stockholder in that company—all of which is a sure sign of confidence.

An example of the optimism that prevails in the West is shown by the fact that although bond houses have said that "it can't be done," the San Joaquin Light and Power Corporation has started in to sell \$3,500,000 worth of 7% Cumulative Prior Preferred Stock at \$98.50 per share and is putting a "Self-Interest" appeal to its consumers. It should be easy to sell stock, the proceeds of which are going to be used in the building of three new hydroelectric plants, to a consumer who has been calling for more power to develop his lands. There are great tracts of land lying idle, waiting for the necessary power before they can be productive, and the farmer who owns those lands benefits doubly by investing in the stocks of the company that will use his money to develop the power necessary to develop his land. The "Self-Interest" idea is a new one but of such common sense that it will be sure to bring about a better understanding and hence more cooperation between the power producer and the power consumer.

The unusually heavy returns from farm products of the past year, ranging from \$90 per acre for beans to \$300 for potatoes and \$450 for onions, has caused wide interest among investors in the opening up of vast new agricultural acreages in the West, especially in those districts that require either electrical pumping for irrigation or electrical pumping for drainage. Hence it is confidently expected that additional extensive service for electricity on the farm will be required during 1920 and the installation of electrical pumps and electrical appliances on the farm will find a ready market.

It is encouraging to note in passing that such development as this means the real substantial growth of a community, and the West is indeed to be congratulated upon this phase of development that is noted on all sides during the present month, and continual new announcements are brought to light from day to day.

## Features of the May 1st Issue

### THE JOBBERS' CONVENTION

A full account of the entertainment plans and business features of the Electrical Supply Jobbers' Convention to be held at the Hotel Del Monte, May 12-14

### THE JOBBERS OF THE PACIFIC COAST

An illustrated survey of their establishments and activities

### EL CAMINO REAL

The work of the California Electrical Cooperative Campaign as illustrated by the development and improvement of electrical contractor-dealer establishments throughout California

### THE HYDRAULICS OF OIL PIPE LINES

By W. F. Durand

A comprehensive technical discussion by a recognized authority



Commercial Aspects of Water Storage

BY E. B. WALTHALL

(As industrial and agricultural developments become more and more dependent upon electricity, the necessity for an uninterrupted and reliable supply of power increases in importance. The following paper, prepared under the title "Commercial Aspects of the Storage of Water at High Elevations" for the Pacific Coast Section N. E. L. A. Convention by the assistant general manager of the San Joaquin Light & Power Corporation, takes up the vital question of water storage in its economic relation to fluctuating conditions and to steam generating plants.—The Editor.)

The storage of water for power purposes consists of the artificial obstruction of stream flow by means of dams that create reservoirs in which water is impounded during the periods of abundance of supply and released under control during the periods

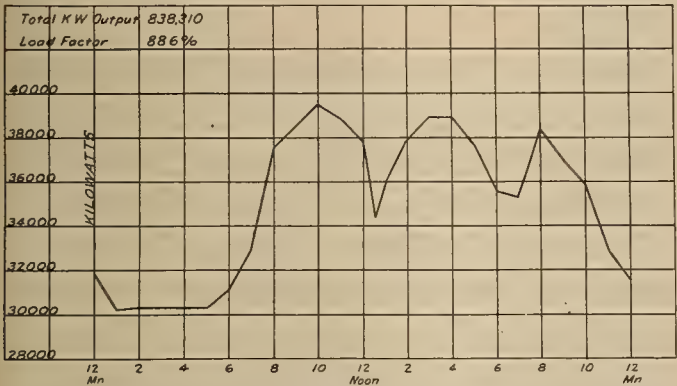


Chart No. 1  
Typical daily load curve of a utility having a combined lighting, industrial power and irrigation pumping load, illustrating the use of fluctuating storage.

of scarcity in order that the water may be prevented from rushing aimlessly and thriftlessly to the sea, and that a uniformity of flow may be obtained and its use prolonged and extended throughout the year.

Storage is used extensively in California for the reason that nearly all of the streams of this state are naturally torrential and to an extent erratic in character, and, therefore, are in a large measure unadapted to their satisfactory utilization for power and irrigation purposes where the needs are so extensive and varied as to require their employment during the entire year and under extreme fluctuating conditions.

The supply of water in our streams is somewhat deficient during the last of the winter, owing to the extreme cold at higher elevations that prevails throughout the long winter period which causes the accumulated precipitation to form into a frozen mass, rich in power and irrigating possibilities. With the coming of the early spring thaws the stream flow increases in volume and gradually approaches a torrential condition as the warm spring rains occur. Their maximum flow is usually reached in the months of April, May and June, after which the streams begin to subside, with a gradually diminishing flow through the summer. The minimum flow is reached in the early fall months, which, in some seasons, almost approaches the stage of exhaustion.

Classification of Storage

Storage may be classified under three different heads and in the order of their commercial importance:

First—Seasonal Storage: This is water that is regularly impounded yearly during the seasons of high runoff and abundant stream flow and released during the low water seasons of the year.

Second—Cyclic Storage: This is water impounded periodically during those years of abnormal precipitation and runoff and that is retained at some length and released during the low water seasons of abnormally dry years. It is usually difficult to find sufficient storage capacity in connection with any development to allow for the full seasonal storage requirements. Where extra capacity is available the problem of whether or not it should be developed depends upon the relative cost of steam and storage per annum, considering the frequency, length and severity of periods of drouth to be expected.

Third—Fluctuating Storage: This is water impounded daily, usually in comparatively small reservoirs or forebays during the hours of low load on the generating plant and released during the peak load.

Seasonal and cyclic storage may be created and have for its purpose the generation of electricity exclusively, or it may be created primarily for the

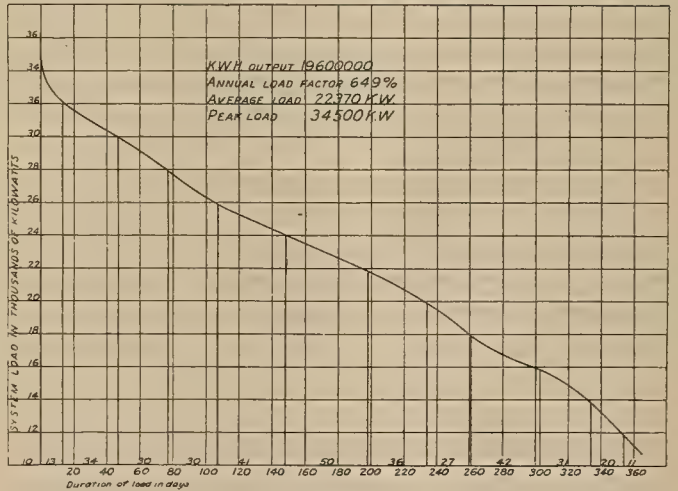


Chart No. 2  
This chart pictures the curve of load duration in days, showing that only a very few kilowatt-hours are turned out at the highest load.

irrigation of lands and incidentally the generation of electricity as a by-product.

Storage and Altitude

The storage of water primarily for irrigation purposes and the generation of electricity as a by-product may be located almost without regard for elevation but with every regard for drainage area and its attendant runoff. However, the storage of water for power purposes must be carefully and accurately located by an extensive investigation and



every consideration given to both elevation and runoff.

Storage at extremely low levels results in a small available head and low kilowatt-hour value per acre-foot of water stored when compared with the cost of creating that storage. Storage at extremely high levels results in a large available head and a

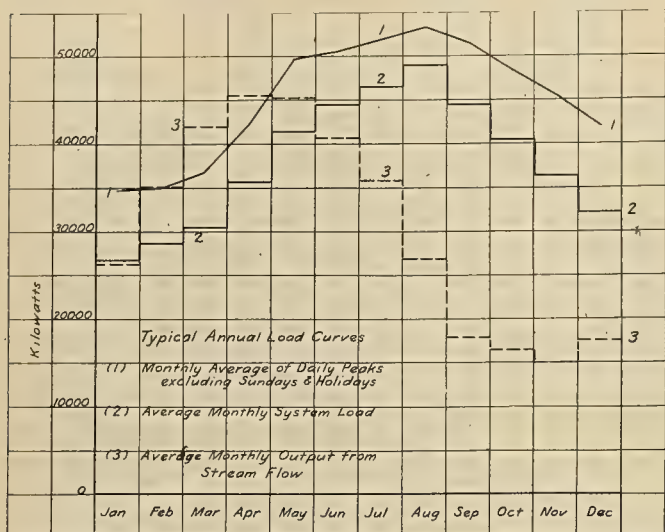


Chart illustrating the use of seasonal storage, and showing a curve of typical natural stream flow output and one of typical load crossing at the end of the high run-off season, both in average monthly kilowatts.

high kilowatt-hour value per acre-foot of water stored, but usually the drainage area controlled and the water supply is so limited and restricted as to not warrant the expense of creating the storage. However, at some point between the two extremes there will be found storage that can be economically developed and which will have a satisfactory head, together with a drainage tributary to it that will furnish a suitable and adequate supply of water.

### Handling a Fluctuating Load

Chart No. 1, illustrative of the use of fluctuating storage, is a typical "Daily Load Curve" of a utility serving a combined lighting, industrial power and irrigation pumping load during the season when the irrigation pumping load reaches its highest point. This load is quite uniform throughout the 24-hour period, as is indicated by the resulting high load factor of 88.6%. Most of the power companies, however, experience a much greater and more sudden variation in load conditions. It will be noticed that even with this load the daily fluctuation is a very large percentage of the peak load carried. These sudden variations in load must either be taken care of by a steam plant or storage must be provided at or very near the head of the hydro plant penstock.

The ideal condition for economy, for high head plants with considerable length of conduit, would be to have an average ditch or uniform amount of water flowing at all times with sufficient storage in the forebay at the head of the penstock to take care of the daily fluctuations. This is not often possible, however, on account of the physical conditions surrounding the point at which the conduit line must be terminated and the penstock begun. Where the pressure conduit leads directly from a large storage

reservoir, no additional fluctuating storage is necessary.

### Storage Reservoirs vs. Steam Plants

Theoretical considerations of economy will show that certain portions of the fluctuating load should be taken care of by steam on any system. The curve of "Duration of Load," Chart No. 2, shows that only a very few kilowatt-hours are turned out at the highest load. As steam plants cost less per kilowatt of installation than hydro plants, steam capacity should be installed down to the point where the annual cost per kilowatt of steam fixed charges, plus operating expense and fuel, is just equal to the fixed charges and operating expenses per kilowatt of hydro capacity.

Chart No. 3, illustrative of the use of seasonal storage, shows a curve of typical natural stream flow output and one of a typical load crossing at the end of the high runoff season. Both curves are expressed in average monthly kilowatts, that is, the kilowatt-hour output for the month divided by the number of hours in the month. The area between the curves after crossing represents the kilowatt-hours which must come from storage or from steam. The maximum peaks for the month are shown in the upper curve of the chart. The maximum distance between the line indicating the hydro output from natural flow and the peak load line represents the minimum steam capacity needed if no storage is provided. Reserves of steam capacity above this theoretical minimum must be provided if continuous service is to be assured, but even a comparatively small storage will eliminate the necessity for installing this additional steam reserve, as stored water may be used while the steam plants are shut down for repairs.

In general it may be said that seasonal storage is necessary to the full economic usefulness of high head mountain plants and that if sites are available, storage should be provided so long as the average cost per unit of output from storage, including fixed charges on the investment, is less than the average output cost from steam.

The rates of any electric utility must yield sufficient income to pay all operating expenses, including the fixed charges such as interest and depreciation on the investment. The investment in storage reservoirs and the cost of operating the same has a very decided bearing on the rates which the company should charge. By the installation of storage the companies operating in regions where high head plants are installed on comparatively small streams with considerable fluctuation in runoff, will be able to carry very much greater loads throughout the year than would be the case if storage were not available.

### Storage and Rates

In the case of the typical annual curve of load and output from natural stream flow, the utility is able to take care of the load during the latter part of the year by using water from storage reservoirs now provided. This means that it can carry practically twice the load with its installation that it could carry if no storage were provided. Of course,



if no storage were provided, it would not be economy to install hydroelectric equipment much above the low water capacity of the stream. The cost of interest, depreciation, et cetera, on storage reservoirs, must be distributed over the income to be received from all consumers, although many may not directly benefit from it, for the reason that their load is taken up by the base water powers or comes at seasons when the storage is not being used. In figuring rates on the cost of service basis, the costs are usually pro-rated among classes of consumers on the basis of the demand of the class on the system, kilowatt-hour consumption of the class, and the number of consumers in the class. This raises the point of whether or not the fixed charges on investment in storage are demand costs or should be proportioned in accordance with the amount of energy used. There are logical arguments for both. Most utilities operating plants backed by storage would not be able to carry the load they do carry throughout the year without the storage which has been provided. Hence it may be said that the charges for storage should be proportioned to the demand on the system. On the other hand, the company having a low load factor and a comparatively high demand, would be able to operate throughout the year with much less storage than a company which had a very high load factor. Either basis might be used and the conditions of the case under investigation should determine which is to be used.

#### Interrupted Service

A hydroelectric development with a large fluctuating storage capacity is in a position to carry its load through considerable periods of time without a supply of water being brought to the power plant, hence it may be possible to carry the load right through such interruptions as those due to breaks in ditches, flumes, et cetera. The water available at the head of the penstock enables the plant to take the fluctuations in load without in any way endangering the penstock.

A hydroelectric development with a considerable storage of water available can feel fairly sure of its ability to carry its load through the low water season of the year, and can reasonably assure its consumers practically continuous service, barring interruptions due to line and other electrical troubles which do not depend upon the water supply.

It will generally be found necessary, however, to install steam capacity as a reserve in connection with the operation of any hydroelectric development if its load approaches its capacity, in order to be in a position to give service of the reliability now generally demanded.

It is customary to locate these plants at or near centers of distribution so that they may be between the usual transmission line troubles and the point where the energy is to be used. If the steam plant is located in a different part of the system from the hydroelectric plant, it is also possible to give service over a great part of the system when lines are inter-

rupted near the hydroelectric power house. It may be economy to install steam capacity to carry a portion of the load which might be carried by storage where the storage sites cannot be developed at or nearly at normal cost.

The curve in Chart No. 4 depicts the resultant power generating possibilities that will be incidental as a by-product to the storage of water in connection with a large irrigation project on a well known California stream that is now in the process of organization, and that will, in the reasonably near future, be launched and construction work begun.

#### Extensive Use of Electricity

Greater progress has heretofore been made in the storage of water for power purposes than for irrigation purposes, due perhaps to a chain of circumstances over which those interested seemingly had no control, and to the evolution of industrial progress that took place in the early development of the territories adjacent to our California streams. Domestic life and activities, together with commercial and industrial activities in the early centers of population, seem to have demanded at first electrical service rather than irrigation service, and from the early and inefficient old steam plants has been evolved the present day power projects to answer the demands for electricity.

It was in 1885 that the first commercial utilization in America of water for power purposes was undertaken, when electric service was rendered to one small town and a few mines located close by. Since that date, by the storage of water and by the employment of suitable agencies and instrumentalities for its utilization, a wonderful progress has been made in the generation, distribution and use of electricity. Fabulous sums of money have been invested in water power plants and its use has permeated every field of human endeavor. Large areas are now served with electricity and a widely diversified use is being made of it. These areas are constantly growing larger and the diversity of use is continually being increased as distribution lines are lengthened and extended. A veritable network of wires has, as a consequence, been formed, not only in the populous districts but in the sparsely settled rural districts as well.

The use of electricity now enters into nearly every phase of domestic, social and commercial life, and is actually indispensable to portions of each. Its use in the home is wide and varied. It lights the commercial establishments and illuminates the streets. It turns the wheels of industry, and city transportation is dependent upon it. It pumps the water for irrigation and extracts the mineral wealth from the earth. It has made cooking a pleasure and the problem of heating a joy. Great areas of arid land have been brought under cultivation and their productivity greatly enhanced by means of pump irrigation, thereby enabling them to support a larger population. Other areas, almost as extensive, of over-irrigated and consequently useless land, have been by the same means drained, reclaimed and again



utilized, thereby automatically creating an additional supply of water that can be diverted and carried to additional areas of arid land.

The country's natural resources, such as oil, coal and the precious and commercially valuable metals, are being developed and mined with electricity to meet the urgent demands for them, and industries of various kinds, incidental thereto and growing out of these and other activities, are continually coming into existence and are in need of electrical service.

#### Importance of Continuous Supply

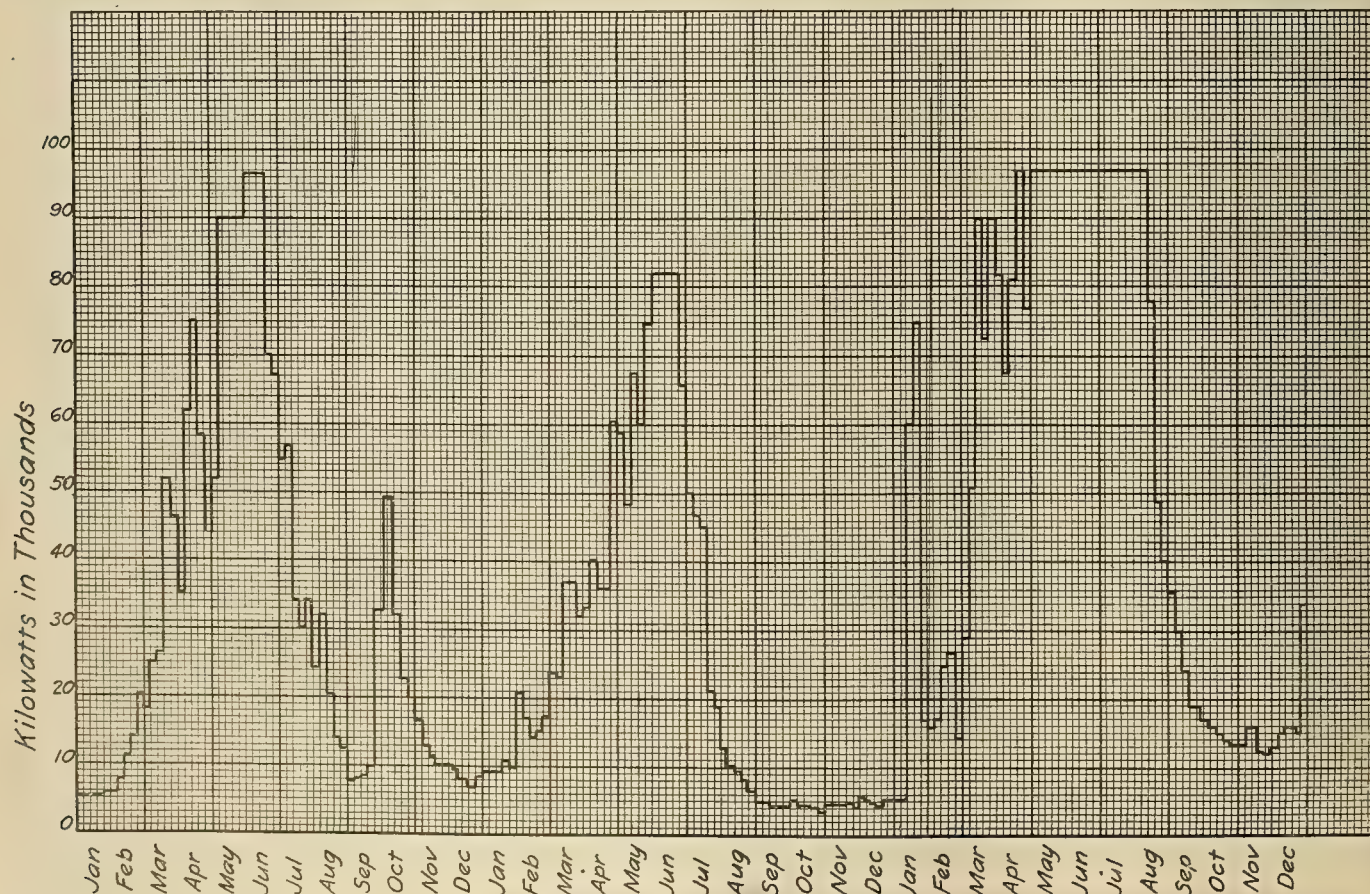
Its use is now so universal and varied and it is so depended and relied upon, that when its delivery is interrupted, even for short intervals, it causes discomfort and inconvenience, and to suspend its delivery for extended periods would result in chaos and cause irreparable loss and damage. Thus, it is apparent that electrical service is to a very large measure intimately connected and closely allied with nearly every form of human activity that enters into our national, state and community life.

The importance and necessity of having an adequate and dependable supply of electricity to answer the needs of the state, especially that of its commercial life, was never so apparent nor so strongly emphasized as during the past three years when a very serious shortage occurred that curtailed in many instances, and actually suspended in other instances, the operation of important industries at a time when they were sorely needed to assist in the prosecution of the late war. A real catastrophe was undoubtedly averted only through a concerted action and a

prompt cooperation on the part of the electric utilities themselves. It was through interconnection that the facilities of each quickly became those of the other. Reserves of stored water and under-loaded equipment were at once made available for use indiscriminately at those points where they were most needed.

World conditions resulting from the war have seemingly added an impetus to an already active agricultural development until it is now being carried on to a degree heretofore unheard of and away beyond the fondest expectation of the most optimistic. Obviously, it is highly important that, if these and other commercial developments are to be fostered, encouraged and perfected, electrical service must be made continuous, dependable, reliable and extensive and be made available to its users by day and by night in spring, summer, fall and winter.

It is going to tax to the utmost all the resources of all those now engaged in the manufacture of electricity in order to supply the demand for electrical service that is now being, and will in the reasonably early future be made upon them. The storage of water at higher elevations must necessarily be relied upon to a very large degree if these extraordinary requirements are to be met satisfactorily and adequately, as it would be unthinkable to undertake to meet those requirements unless it were possible satisfactorily to overcome and correct, so to speak, the lack of uniformity of conditions of the stream flow already described, that exists in nearly all of the streams of California.



Curve illustrating resultant power generating possibilities incidental to the storage of water in connection with a large irrigation project now under way in California



### Growing Demand for Irrigation

Keen-sighted observers are of the opinion that the limit of practical usefulness of the streams of California for irrigation purposes, without further storage, has been reached. The water supply for irrigation purposes that is now available is very largely wasted through extravagance and inefficient methods of distribution and storage and unscientific methods of application to the land. Large areas are already water-logged and at times important flood discharges are actually wasted. They advise and point out to us that the demands that will be made upon us for foodstuffs will yearly greatly increase. It would certainly be folly for us to limit ourselves in any advantage that comes to us from our natural water resources.

Since we have reached the practical limit of the water resources that are obviously available for irrigation, the obvious thing to do is to develop new resources by enlarging upon and developing nature's gifts by means of storage. Vast areas of arid, but fertile land in California are now lying idle, awaiting only the application of water to make them highly productive and remunerative. Other areas, vastly extensive, that are now being irrigated from their underground strata by means of pumping, are badly in need of a supply of water to replenish those strata, and dependent upon action along this line, pumping in these areas will increase or diminish.

To illustrate generally the extent of the need for both stream and pumped water in California, par-

ticular reference will be made to conditions existing in the San Joaquin Valley at this time. There are in the valley approximately 6,500,000 acres of valley agricultural land and of this amount approximately 1,400,000 acres are being irrigated by stream flow through a number of gravity canal systems. About 500,000 acres are being irrigated from wells by means of pumping. It is conservatively estimated by those who have given careful study to conditions, that if all the streams flowing into the San Joaquin Valley were reservoired to their ultimate capacity, the flow of the streams, together with the reservoired water, would irrigate only about one-half of the agricultural area. A conservative estimate of the number of acres of land in the San Joaquin Valley that would require irrigation by means of local pumping is 2,500,000, requiring approximately 250,000 electrical horsepower to accomplish it.

To the end that our natural resources may be developed to the extent of our requirements, and that their benefits may be enlarged upon and extended, and that our industrial and commercial activities may be multiplied and increased, the interest of the public and the press should be aroused and their support enlisted to assist actively in the efforts now being made to obtain needed capital for the development of those projects so essential to our commercial and industrial life and to secure favorable legislation, both national and local, that is in itself vital to those projects.

## Internal Combustion Engines vs. Central Station Power

BY R. E. FISHER, W. W. SHUHAW AND CLAYTON INGALLS

(In many isolated communities the way has been opened for the power company by the work of the internal combustion engine. A detailed comparison of the value of these two sources of power in various lines of work is given in the following paper, prepared for the Pacific Coast N. E. L. A. Convention. Of the authors the first two are members of the commercial department of the Pacific Gas & Electric Company and the third is Pacific Coast manager for the Crocker-Wheeler Company.—The Editor.)

The necessity of a paper on the subject of "Internal Combustion Engines vs. Central Station Power" at this time might be questioned by some, owing to the somewhat startling publicity given by the larger oil companies advising the discontinuance of the manufacture of distillate. It is the aim of this paper to make a general resume of conditions as they exist today with reference to this subject. Conditions affecting all prime movers have been rapidly changing during the last few years and the contrast between the present day status of prime movers and that of the past should be both interesting and instructive.

The subject of this paper is so broad in its scope, and conditions of the application of power vary to such a marked degree that in order to make a close comparison of the relative merits of "Internal Combustion Engines" and "Central Station Power" it will be necessary to make a general survey of conditions, and by process of elimination approach a neutral point somewhere between the two extremes where

the two forms of power are in actual competition.

As a prime mover in automobile, motor boat or aeroplane, one could not consider the central station as a contender against the gasoline engine, and, on the other hand, it would be difficult to imagine a sewing machine, vacuum sweeper, washing machine or other household labor saving device being operated by an internal combustion engine.

A survey of the conditions adjacent to a power company's distribution lines reveals the fact that approximately eighty per cent of all the power users are consumers of the central station, and of the factory and industrial users practically all, including the manufacture of internal combustion engines, are using power from the central station.

### Competition in Rural Communities

This narrows the field of actual contact and competition down to the rural communities where central station power service is available and where the power duties are principally pumping for irriga-



tion, ensilage cutting, milk cooling, refrigerators and sundry farm uses.

It is not the intention of this paper to depreciate the value of the internal combustion engine, for it is well recognized that it is a wonderful advancement in the method of converting heat directly into power without which many of our most modern and necessary inventions would have been impossible. But with all of its wonderful advantages, it is not without its disadvantages, and being an intricate piece of machinery, it requires skilled and expert attention in its operation, to get out of it its best efficiency.

#### Aid to Power Companies

In many ways the internal combustion engine is of great assistance to the power company in preparing and building up a community or line of industry, making it a profitable field for a power company to supply. This is especially true of isolated communities remote from power lines, in such localities as are being reduced from raw lands to productive farms. In such fields as these it is the usual experience that when the gas engine is worn out the power company will find it profitable to enter. Therefore, the internal combustion engine may be viewed as a real assistance and a good friend of the power company.

In connection with the gas engine it is also only proper to mention the farm lighting units which have latterly come into vogue. Many of these are being sold in sections where central station power is not available and in conjunction with the internal combustion engine prove of very great assistance in developing the field for the power company. It is suggested that the power companies should encourage the installation of these farm lighting units wherever possible.

To the consumer of power so remote from the central station lines that extensions are impracticable, the gasoline engine is recommended as being the best substitute to be obtained.

#### Classes of Combustion Engines

Internal combustion engines can be grouped into three general classes and each class subdivided into two subdivisions:

- (1) Diesel Type—Fuel Oil Engine
  - (a) Four strokes per explosion, or four-cycle
  - (b) Two strokes per explosion, or two-cycle
- (2) Oil Explosion Engines—Hot Ball Type
  - (a) Four-cycle type
  - (b) Two-cycle type
- (3) Otto Type Gasoline or Distillate Engines
  - (a) Four-cycle engines
  - (b) Two-cycle engines

To obtain a high efficiency in the Diesel type of engine it is necessary to have a very high load factor over a long period of time, and as very few power consumers have this condition of load, Diesel engines have not been able to compete with the central station power.

The Diesel type of engine is used extensively to operate ships, submarines, and a few isolated central station plants where off-peak or valleys in the station load curve can be filled by putting pumping or ice machine loads on.

Oil explosion engines receive the air and fuel in a manner similar to that of the Diesel type engine,

the principal difference being that there is less compression and that the fuel is ignited by spraying against a hot ball which is kept at a dull red heat.

#### Disadvantages of Industrial Use

Both the Diesel engine and the oil explosion engine are built in large sizes and their use in industrial plants of relatively large power requirements is not advantageous for several obvious reasons.

First: The distribution of any great amount of power by means of belting and counter shafting is very inefficient.

Second: Any interruption in the operation of a large prime mover on which a plant depends for power would result in the tying up of the entire plant output and the idleness of the entire force during such interruption.

Third: Conditions of manufacture are changing from time to time and one has no assurance that an expensive prime mover installed now would be adequate in a few years hence.

Electric motors driven by central station power afford a safe, practical and inexpensive method of overcoming all of the disadvantages mentioned above.

Electric power can be transmitted in any desired quantity to any desired point in the factory, with little or no loss, and can be applied directly to any machine without belts or shafting. Failure of any one motor only means the delay of one man and one machine, while fuses are being replaced, or, at worst, a new spare motor is being put in place of the one in trouble. Close regulation of speed, so essential in machine work, is obtained in electric drive and is very nearly impossible in an internal combustion engine. Industrial and factory managers are so keenly alive to the advantages of electric power that argument with them is not necessary.

The gasoline or distillate engine, known as the Otto type, was the most common type that the central power salesman met in open competition. It is built on both the four-cycle and two-cycle principle in sizes from one horsepower up.

#### Fuel Consumption

The engines require on an average 1/8 to 1/10 gallons of gasoline or distillate fuel per horsepower-hour, and it is on this point that the gas engine salesman rests his case. The evidence is complete. Here are his figures:

A 10-hp. engine @ 1/10 gal. distillate per hp.hr. for 10 hr. equals 10 gal.  
 10 gal. distillate @ 12c. equals \$1.20 per day against a 10-hp. motor requiring 10 hp.  $\times$  85% efficiency equals 8.8 kw.  
 8.8 kw.  $\times$  10 hr. equals 88 kw.  $\times$  3c. per kw-hr. equals \$2.64 per day.

Sometimes the uninformed farmer takes his statement and his figures at their face value without full investigation, with the result that after a year or so of trouble he comes to the central station power man for relief, and has a second-hand gas engine for sale at any figure.

Already the cessation of the manufacture of distillate and the enforced use of gasoline has thrown fear and consternation into the hearts of the users of internal combustion engines, and with the ever



rising costs of gasoline there is no sign of a rainbow of hope on the horizon of gloom. And the fuel cost of operating a gas engine is by no means the total cost of operating the plant.

### Running Cost

The high first cost and rapid deterioration of internal combustion engines, together with cost of lubricating oils and charges for skilled labor in making repairs and adjustments bring the actual cost of power at a figure very much greater than the salesman's estimate.

The farmer who buys a gas engine may consider himself a handy man and able to keep ordinary farm machinery running, and he may be all of that; but the gas engine, with its intricate parts and adjustments, requires the skill of a specialist and very frequently an engine is damaged beyond repair by the neglect of some minor defect which, to the untrained man, does not seem to affect the running of the machinery.

When the purchaser has paid the price and received his goods, the transaction, as far as the salesman is concerned, is complete. The goods have been delivered as per the order, but the purchaser must assume the whole responsibility of its operation. When something goes wrong the salesman may be in the far end of the state, or no longer on the job. The factory is ignorant of any promise the salesman has made. They will send an expert surely, at the purchaser's expense, to make an examination and report. And days slip by. The engine is examined by the expert. Some new parts are needed, or perchance, the repairs should be made at the factory, in which case the engine has to be taken down and packed for shipment, and more delay. It is finally repaired and working again, but the season for doing the work engaged in has well advanced. Crops have suffered and profits reduced, and another item added to the cost of power.

### Continued Central Station Service

On the other hand, when the central station closes a contract to supply electric power to a consumer, it has assumed a serious responsibility to render a service of twenty-four hours of every day in the year and years. It should, and generally does, fulfill its obligation to the letter. It maintains, for instant use at any time, without warning, a supply of power up to the maximum capacity of the consumer's apparatus. In order that it may meet its responsibilities, it must make a considerable investment in lines, transformers, meters and generating equipment, and can only be reimbursed by continued pleasant relations with the consumer. The central station assumes all the worries that the consumer may have and stands ready and willing at all times to give him personal attention.

With this fact in view, the central station salesman should carefully analyze the condition of the service desired and satisfy himself first of all whether or not the business is to be mutually advantageous. Failure to do this may mean a dissatisfied

consumer with loss to both the consumer and the central station.

The power company, with its great diversity of load, and acting as a clearing house for meeting the demands of thousands of consumers, is in an infinitely better position to reduce the cost of power output than the single individual who attempts to maintain a power plant for his sole needs.

Throughout the days, weeks and seasons, by the law of averages, when one consumer wants power, another is not using it, or during the irrigation season little or no power is used for reclamation. This enables the central station to install large units of power and to keep them much more uniformly loaded, thereby getting the highest efficiency. The man dependent on his own power plant would be required to have capacity to handle his peak load during his time of regular operation, and should he require any power at off hours, would be obliged to operate a large plant to furnish a small amount of actual power.

### Summarized Comparison

Therefore, a summary of general comparison between central station power and internal combustion engines would appear as follows:

Central Station Power	vs.	Internal Combustion Engines
Low first cost of apparatus.		High first cost of apparatus.
Low maintenance.		High maintenance.
Small depreciation		High depreciation.
Low attendance cost.		High attendance cost.
Simplicity in starting		Difficulty in starting.
Definite cost of operation.		Uncertainty as to total cost of operation.
		Increasing high cost of fuel.
Simplicity of installation.		Difficult requirements of installation, including necessity of cooling water.
		Limited as to unit installed.
Unlimited source of supply.		Uncertain of continuous operation.
Continuity of service.		

And finally, the problem comes down to one of service—that intangible something that cannot be measured in dollars and cents—because until the service is performed it is only a promise and after it is done only a pleasant memory. But the central station does give it and gives it freely as a part of its contract, and while it is hard to show where it is in the rate per kw-hr. for energy, yet it is none the less there and soon the consumer who receives it feels it, and that is the reason why power users are leaving the internal combustion engine with its worry and its troubles and its responsibilities, and asking for central station power service at such a rate that the central stations are at their wits' end and trying to build plants and lines and substations to keep pace with the new demands.

### WESTERN AGRICULTURE

In 1917 the state of Washington passed New York as the heaviest commercial apple-producing state in the Union, showing 20 per cent of the total commercial crop of the United States. The Wenatchee and Yakima valleys shipped more than 16,000 cars of apples in that year.



# Economic Use of Galvanized Steel Wire

BY J. P. JOLLYMAN AND J. F. STRACHAN

(The present high price of copper has focused particular attention upon the desirability of substitutes such as galvanized steel wire for transmission lines. The suitability of a conductor varies with the load factor and the voltage, and in the following paper data is given to show in just how far the use of galvanized steel in power transmission is economical. The authors are respectively head of electric construction, Pacific Gas & Electric Company, and sales representative, Allis-Chalmers Manufacturing Company, San Francisco. The paper is prepared for the Pacific Coast Section, N. E. L. A. Convention.—The Editor.)

The selection of the most economical size of conductor for an electric transmission line is governed by "Kelvin's Law." This law, reduced to its simplest form, states that the most economical size will be obtained when the fixed charges on the investment in the conductor are equal to the cost of the energy lost in the conductor. The period taken is usually one year.

With present day fixed charges and costs the total annual cost is a rather flat curve over a considerable range of conductor size. In many cases this range will cover three consecutive B & S gauge sizes, with a variation in total annual cost of hardly more than 5%. In view of the uncertainty regarding the

given. The fixed charges include interest, depreciation, and taxes which in California are based on gross earnings and therefore become a fixed charge against the earning power of additional investments.

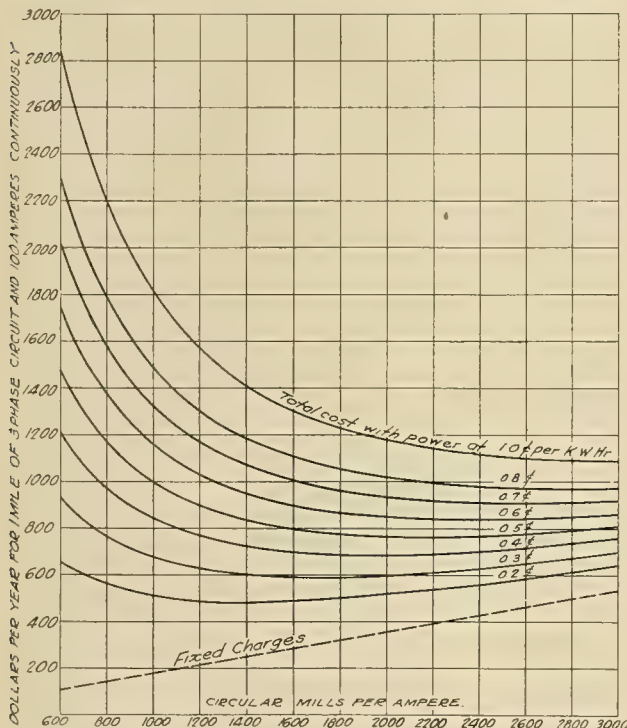


Fig. 1. Annual cost of copper lines. Fixed charges at 12% per year on copper at 30c. per lb. For other currents multiply cost by  $\frac{\text{effective current}}{100}$

exact current to be transmitted in many cases, together with the fact that an increased investment is not justified unless a substantial profit can be realized, Kelvin's law should be applied with caution. The total annual cost should be plotted in the form of a curve and the best size determined by a study of the curve and consideration of all factors that may have a bearing on the subject.

## Cost of Copper Wire

Figure 1 shows annual cost curves for copper. The cost of copper wire on the line has been taken at 30c. per lb. and the fixed charges at 12% per year. Total cost curves for several values of power are

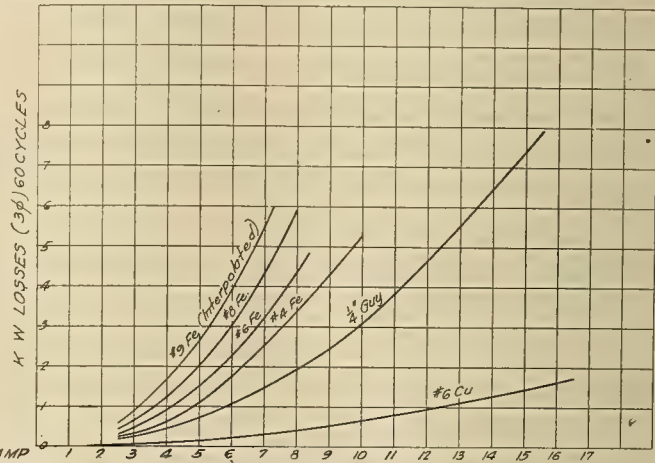


Fig. 2. Curves showing 3-phase I<sup>2</sup>R losses of iron wire and No. 6 copper for various currents

The proper value for the cost of lost power may be selected to meet the conditions encountered. The curves are drawn for 100% annual load factor. If the annual load factor is less than 100% the equivalent loss may be computed and a correspondingly lower price taken. For example, assume the annual losses are one-half those due to 100% load factor and the cost of power is 0.6c. The desired results

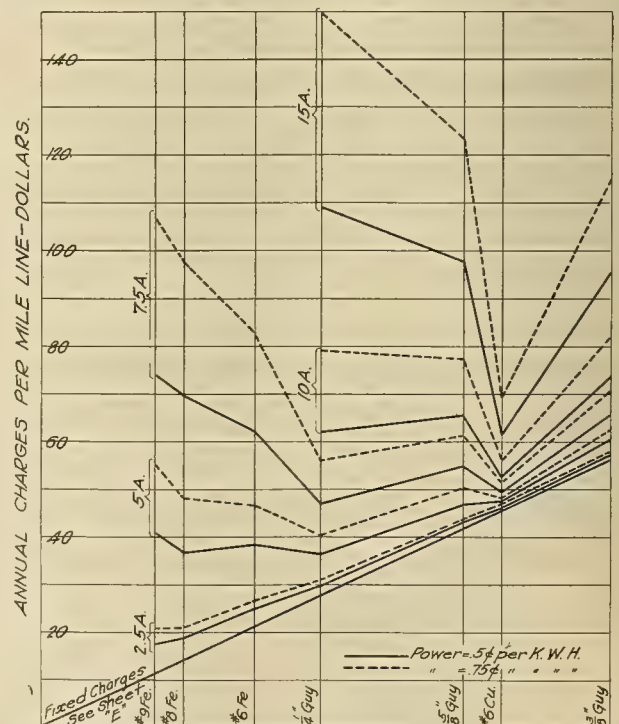


Fig. 3. Curves showing total annual costs (fixed charges + I<sup>2</sup>R losses) at 25% L.F. for iron wires and No. 6 copper.



can be obtained from the curve for the total losses with power at 0.3c.

When the load factor is low and the line of considerable length in proportion to the voltage, the permissible voltage drop or the safe carrying capacity may become a factor in the selection of the required size.

Many cases occur where the economic size is smaller than No. 6 copper, which is usually the smallest size mechanically suitable for line construction.

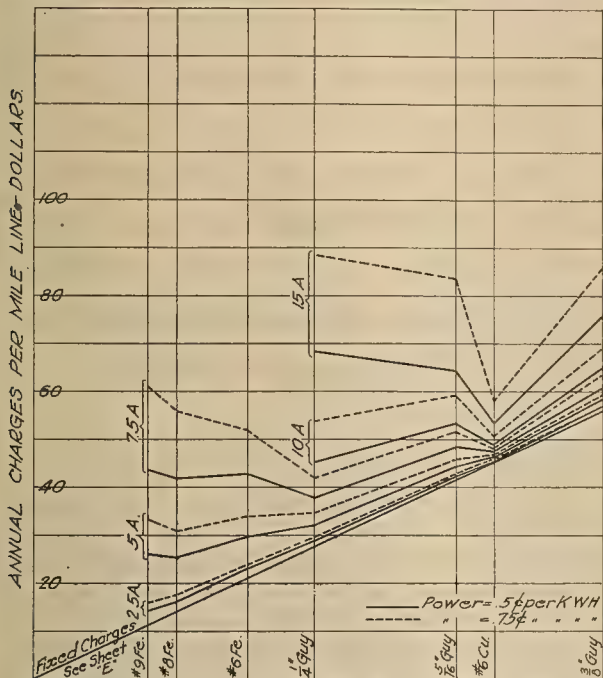


Fig. 4. Curves showing total annual costs (fixed charges + I<sup>2</sup>R losses) at 12.5% L.F. for iron wire and No. 6 copper.

tion. Aluminum is not satisfactory as a solid conductor in any size or as a stranded conductor smaller than about No. 1.

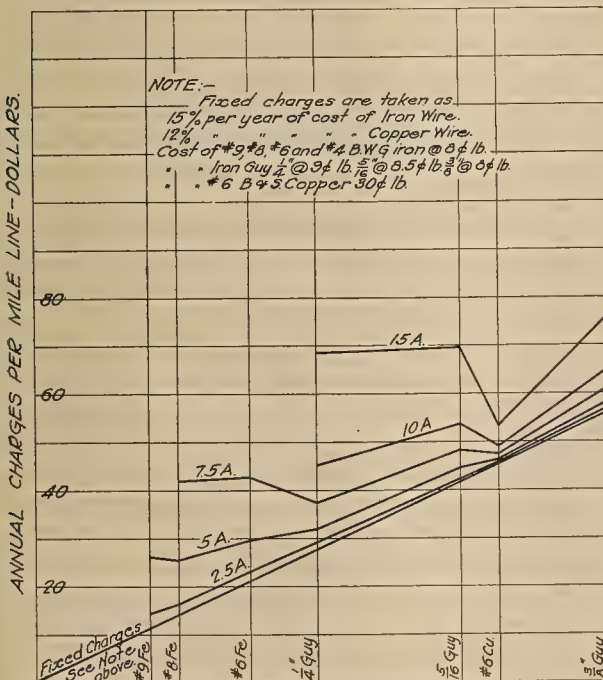


Fig. 5. Curves showing total annual costs (fixed charges + I<sup>2</sup>R losses) at 8 1/3 L.F. and power at 0.75 kw-hr.

### Factors in Use of Steel Wire

Galvanized steel wire possesses the requisite mechanical properties for line work and costs less than copper, but its losses are higher than copper and the question arises, Is its use economical for loads below those for which No. 6 copper is suitable?

Being a magnetic material, the effective resistance of galvanized steel wire varies with the density and frequency of the current conveyed. This subject was investigated by Mr. R. C. Powell and reported in his paper presented in 1918 and published in the Journal of Electricity April 1, 1918. A summary of his results is given in Fig. 2.

Knowing the effective resistance of galvanized steel wire the total annual cost of transmitting any given amount of current over each size may be computed, and curves drawn from which the most economical size may be selected. Such curves have been prepared: Fig. 3, Fig. 4 and Fig 5 showing the total annual cost of transmitting several different currents over No. 9, No. 8, No. 6 B.W.G. solid galvanized steel wire 1/4-inch, 5/16-inch, and 3/8-inch galvanized steel strand and No. 6 copper, all at load factors of 25%, 12.5% and 8 1/3% with power at 0.5c. and at 0.75c. per kw-hr. Fig. 6 gives a summary of the results obtained from an inspection of Figures 3, 4

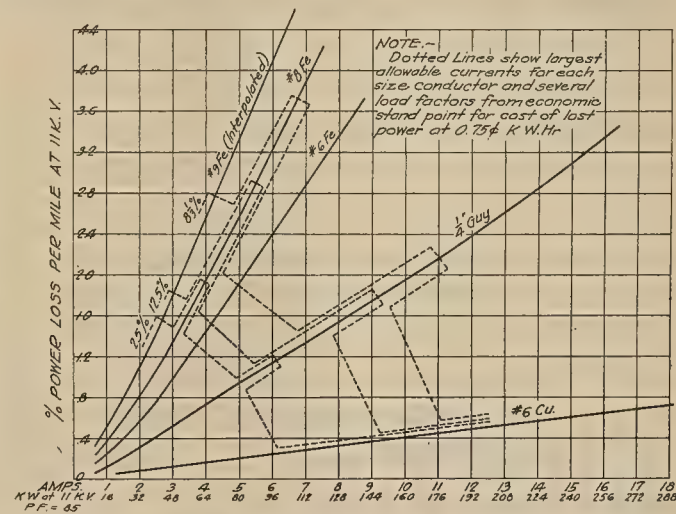


Fig. 6. Curves showing relation between kw. at 11,000 v., 3-phase, 85% P.F. iron wires and No. 6 copper.

and 5 with the approximate economic limit of current shown for each size of wire at different load factors. Assuming for the moment the use of such wire on 11 kv. circuits it will be seen that the loads which may be economically carried at load factors of 25% or less produce voltage drops greater than can be tolerated in lines of any considerable length.

However, for small loads such as 80 kw. or less at 11 kv. and 25% load factor iron wire represents a much lower annual cost than copper, hence should be used whenever the voltage conditions permit.

### Variations in Economy

An examination of these curves reveals some interesting facts. No. 6 galvanized steel does not seem to be economical for any load. No. 4 costs more than 1/4-inch strand and has greater losses,



hence should never be used. The fixed charges on 5/16 guy are so near those on No. 6 copper that it should not be used and any larger size of steel strand will be still less economical than copper. Situations may arise requiring the use of steel strand to obtain its mechanical strength.

Based on an allowance of 1% per mile voltage drop in 11-kv. lines, the following limiting loads may be carried:

Size of Conductor	Max. Load at 85% P.F.
No. 9 Galvanized Steel	20 kw.
No. 8 Galvanized Steel	30 kw.
¼-inch Guy Strand	60 kw.
No. 6 Copper	275 kw.

The limiting loads for other voltages may be

determined by voltage drop on low voltage lines or by the limit of economical loading for high voltage lines. As pointed out by Powell, galvanized steel is subject to rather rapid deterioration on lines where the voltage is high enough to cause corona or brush discharge and this characteristic may cause its rejection in some cases where it might otherwise be suitable.

Galvanized steel is the most economical conductor for loads that fall well below the minimum economical load for No. 6 copper. All things considered, galvanized steel will probably be found most useful for carrying light loads in a high voltage distribution system.

## Electric Furnaces in California

BY W. M. SHEPARD

(The electric furnace is one of the most rapidly developing loads in Western industry. The advance made possible through their use is discussed in the following paper and the number and type of installations already made in California are reviewed by the author, who is sales manager of the California-Oregon Power Company. The paper is one of those for discussion at the Pacific Coast Section N. E. L. A. Convention.—The Editor.)

There are installed in California at the present time some fifteen or more electric furnaces, ranging in capacity from one to six tons per charge and representing a connected load of over 15,000 kva. The operation of these furnaces has proved quite successful, and their use will, in our opinion, continue to increase, not only in new plants, but also in old plants by displacing existing furnaces of older types.

It appears from the investigation which we have made that the field for these furnaces will continue to increase as the population and manufacturing facilities of the coast grow; for example, the use of manganese steel castings made by electric furnaces is increasing in farm tractors manufactured in California. It is apparent that the growth of the tractor business, which in turn is dependent upon the development of the agricultural sections, will stimulate the use of the electric furnaces, which is also true in other lines of manufacture.

All of the furnaces in use in this territory are of the "arc" type, and are principally used in making steel castings and alloy steel, such as manganese steel.

While the cost for heat in the electric furnace, as represented by the power consumed, is greater than this cost for other types as represented by fuel costs, there are other economies incidental to the operation of the electric furnace which in large measure counterbalance the cost of power, and in addition to this, the product of the electric furnace is superior.

The use of the electric furnace results in greater output from a given sized furnace and from a given floor space, due to the shorter time required by the electric furnace to handle a charge. The shorter time required by the electric furnace also results in lower labor costs and very frequently increases the output of the entire establishment, thereby cutting down overhead cost. The electric furnace castings

are better and more uniform, and the metal is denser, more homogeneous and stronger. Electric steel is higher in tensile strength and elastic limit, and shows greater resistance to fatigue than other steels. Steel castings from the electric furnace show less shrinkage and are freer from blow-holes than ordinary steel castings. The reason for the superiority in electric steel is that it is made in a reducing atmosphere in a closed furnace, and does not come in contact with combustion gases. Its composition can therefore be more easily controlled, and it is kept freer from gas inclusion. The electric furnace can bring its charge to a higher temperature, and maintain it at this temperature for longer periods of time than other furnaces without affecting the quality of the metal, and for this reason, thinner and more intricate castings can be made with smaller loss. There is less loss of material in risers and headers, due to the higher temperature, and more fluid condition of the metal. There is also less loss due to defective castings.

The electric furnace melts its charge in a neutral or reducing atmosphere, which eliminates the losses of the added elements when making alloy steels, and brings about more exact and uniform results. In the open-hearth furnace, manganese and silicon added to the steel are oxidized in considerable quantities, the losses of these added elements ranging at times above 30%, while in the electric furnace this loss is practically eliminated. This results not only in saving considerable quantities of these expensive elements, but also in more exact control of the composition of the steel. The melting losses in the electric furnace are also much lower than in either the open hearth furnace or the converter, ranging around 3% or 4% for the electric furnace as against twice this amount for the open hearth furnace and five to six times this amount for the converter.

These savings are material in offsetting the cost of power, but the greatest advantage of the elec-



tric furnace is in the higher grade steel produced and the higher percentage of the melting stock that gets into castings.

The electric furnace is inherently better adapted to exact control of the composition of the steel; the percentage of added elements can be controlled with an exactness very difficult to attain in other types of furnaces, and undesirable elements can be more completely eliminated. For these reasons, it is possible to handle poorer grades of scrap material in the electric furnace, and to work these poorer grades up into high grade steel.

The electric furnace is built in either the acid or basic type, the acid type furnace being that generally used in California. The acid type furnace handles its charge in less time, resulting in greater output, and is used almost altogether for foundry work. The basic type furnace is only used where considerable refining of the metal is to be carried on, and sulphur and phosphorus are to be eliminated.

The furnaces in general use in California, except very small furnaces, are all three-phase and the characteristics of the load approximate industrial load. The load is fairly well balanced and the power factor is generally somewhat higher than induction motor load, running up to as high as 90%, and the load factor is good where the furnaces are kept busy. This, however, depends on the work available for the furnace. During the melting of the charge, the peaks may be considerable unless close attention is given to the operation, which would of course result in poor load factor. This, however, is pretty well under the control of the operator, who, if skillful, can keep this peak demand low during the melting period, and not impair his load factor. Where rates are based on the demand or load factor, considerable attention is given to this point by operators, and as a result, higher load factors are attained.

There is another advantage in keeping the furnace busy all the time, making the operation continuous for the twenty-four hour period if possible,—that is, the saving in furnace linings. When the run is continuous the lining is continuously maintained at a high temperature, whereas if it is intermittent, the lining is alternately heated and cooled, and the expansion and contraction resulting reduces the life of the lining. Furthermore, intermittent operation results in higher electric energy consumption by the furnace, as energy has to be supplied to bring the cold furnace up to working temperature as well as to treat the charge. In the case of a three-ton furnace which came under our observation, it required four hours for the first heat and two hours for each succeeding heat when the operation was continuous.

In the installation of electric furnaces it is very desirable to have the furnace transformers installed close to the furnace, and special attention should be given to the installation of the leads from the transformers to the furnace to see that the three phases are so interlaced as to reduce the inductive drop to a minimum. The furnace transformers step down from the ordinary distribution voltage of 2200, 6600

or 11,000 volts to the furnace voltage of in the neighborhood of 100 volts, and at this low voltage, of course, the current is very high and the inductive effects are considerable, unless the proper precautions are taken. The practical advantage of attention to this point is of course to better the power factor.

The transformer capacities for the arc type electric transformer are approximately as follows:

Tons Capacity	Transformer Kva.
1	500
2	800
3	1000
6	1500

The current in the arc type electric furnace is controlled by raising or lowering the electrodes on much the same principle as the current control of the ordinary arc lamp. This control is both automatic and hand. The furnaces themselves are very substantial pieces of apparatus, and give very little trouble. Most of the operations of the furnace, such as pouring, operation of the electrodes, et cetera, are motor controlled, and can be easily and quickly manipulated by the operator.

It is not our intention in this short paper to go into details of construction or operation of the electric furnace, but to throw some light on the extent and possibilities of this class of load for central stations in this section of the country.

It is our opinion that the electric furnace has reached a point where it is able to stand on its own feet, and does not require any particular nursing by the central station. Most of those operating in this territory are working under the regular power rates given other power consumers for loads of similar amounts and load factors, and these furnaces are proving successful in their operations.

The cost of electric power is less of a factor for the alloy steels than for straight steel castings, inasmuch as the total cost and selling price of the alloy steel is considerably higher and the cost of electric power is relatively less important.

The cost of electric power, while quite a considerable item, is not the determining factor in most cases. The factors determining the location of the furnace and whether it will be electric, are various, including labor conditions, availability and price of raw materials, available market, freight rates, et cetera, and the quality of materials available and of the product desired. Any one of these factors may have as much or more influence than the cost of electric power.

The power consumption varies from around 500 to 550 kilowatt-hours per ton of metal produced to as high as 850 kilowatt-hours, depending on the treatment given the metal, size of furnace and whether the run is continuous or intermittent.

The cost of electric steel in the ladle for ordinary castings is of the order of fifty dollars per ton, while alloy electric steel, such as manganese, will be of the order of one hundred dollars per ton or above. From these approximate figures, some idea of the



relation between power costs and total cost of steel in the ladle may be had.

At the present moment it appears that the steel furnaces on the coast have a capacity considerably in excess of the normal demand. This condition has been brought about by the expansion of the industry to meet the rush of business arising out of the war, and as war business has now fallen away the existing furnaces are running at an output materially below capacity.

How long this will continue, it is, of course, difficult to say, but as long as it continues it will, of course, retard the growth of the electric furnace business.

## AUTOMATIC PROTECTION OF SMALL MOTORS

BY G. E. ARMSTRONG

(The most suitable mode of protecting small motors such as are used in pumping plants and in small industrial applications is the subject of this paper prepared for the Pacific Coast Section N. E. L. A. Convention.—The Editor.)

It appears to this sub-committee that it would be more desirable to specify what it believes to be most suitable in the way of protection for small motors such as are used in pumping plants and in small industrial applications, rather than to point out the particular pieces or manufacture of such apparatus as would perform the service required.

Due to the fact that this subject is to be confined largely to small motors where the cost of the motors is low and the cost of rewinding or repairing correspondingly low, the apparatus for protection of such motors, in order to be available, must necessarily be of very low cost and be of such a nature as not to require skilled maintenance. These requirements, therefore, limit what we might recommend as requiring protection, as certain contingencies may only be protected against by more or less complicated and expensive apparatus. Of this latter class might be mentioned reverse phase relays which, although very valuable for the protection of motors, are generally quite complicated, require expert attention and are expensive. It is believed that without question the real way to protect a small motor is to protect it against high temperatures and low speed.

These two conditions are also those which are fundamental in the protection of motors of any size. Taking the last first, the proposition of low speed involves many factors. It includes low voltage or no voltage, loss of solder in end rings, overloading, scraping of rotors, and low frequency. Nearly all of these features will result ultimately in high temperatures. Loss of solder in end rings and scraping of rotors will, of course, result in a more rapid rise in temperatures than will low voltage, low frequency or overloading.

As long as a motor performs its duty and does not reach dangerous temperatures, there appears to be no good reason why it should automatically be taken off the line, that is, overheating for a period of time which does not permit of permanent injury

to the winding is of no consequence. If the voltage dips to zero for a moment and again returns to normal without having permitted the speed of the motor to go to such a low limit that it will not again be able to obtain normal speed without drawing such heavy currents as might injure it, the motor should not be disconnected from the line. This particular feature is of considerable interest at this time, since the use of apparatus to do this duty would be in a large way a justification of the use of expensive installations to shorten or eliminate interruptions; that is, if the proper protective relay systems were installed on the transmission system, a short circuit would merely result in a momentary dip in voltage on the system during the time between the occurrence of the short and the opening of the proper switches to remove it. At present it is required that motors be equipped with low voltage relays which are usually set to operate instantaneously on a decrease in voltage of 50% to 75% of normal. With equipment such as this installed, the result is that a short circuit even of a very short duration causes the load to be dropped due to the operation of the low-voltage releases.

If the motors were protected by a device which would permit the opening of the switch only when the speed of the motor decreased too low, then the resumption of normal voltage would allow the motors immediately to pick up the load and the consumers would suffer no interruptions. The present practice is particularly reprehensible when applied to pumping plants, due to the fact that many of the motors lose their prime when they stop and the low water level makes it impossible to start up without waiting for the water to rise in the wells. Interruptions of considerable length are suffered by the consumers, due to a very brief interruption in voltage.

Information has recently come to hand regarding the method of protection of motors in precious metal mines. It has been found that it was impossible to apply any of the present known protective devices to these motors; even the use of fuses and circuit breakers was unsatisfactory, since it was necessary to use fuses of such large capacity or set the instantaneous automatic overload breakers at such high values of current that they were useless in protecting the motors against overloading which, while not of sufficient magnitude to blow the fuses or open the switches, was great enough to damage the motors. The reason for this state of affairs was that the motors were very commonly called upon to carry loads greatly in excess of normal, due to heavy starting conditions when the machinery had been idle for a period, or when jams occurred due to the nature of the material handled.

However, it was brought out that some form of thermostatic protection would have been desirable since a large part of the trouble was due to overloading.

The conclusions to be drawn are that satisfactory devices intended to operate at predetermined low speeds to cut the motors off the line, and suitable thermostats for application to the motors would give the most desirable protection for such motors.



# Central Stations and the Rating of Motors

BY JOHN HOOD

(The use of motors having a large overload capacity which is seldom or never utilized involves the maintenance by the power company of a great quantity of unnecessary and expensive idle equipment, and at rates based on the nominal rating of the motors instead of their real capacity. In the following paper, prepared for the Pacific Coast Section N. E. L. A. Convention, under the title "Use of Continuous Motors as Affecting Central Stations and Consumers," it is pointed out that what was originally a safety provision has tended to become an abuse, for which the continuous rated motor is a remedy. The author is local engineer with the General Electric Company, San Francisco.—The Editor.)

The history of the electrical industry has been one of rapid progress—of rejection of the inefficient for the relatively efficient—of rejection of wasteful practices for those less wasteful. Developments of the present day indicate an active continuation of this very satisfactory record. Careful analyses of the characteristics and life of insulations, investigations covering a considerable period of years and under various operating conditions, have forced the conclusion that our art has been wasteful in adhering to the low operating temperatures which have, in the past, been deemed essential in safeguarding the insulation of electrical machinery.

Varnish treated fibrous insulations, such as commonly used in the construction of general purpose motors, have their safety subject to a rather well defined temperature limit above which failure due to charring or burning will take place, but below which the length of life does not vary with changes in temperature. 105° Centigrade is given by the American Institute of Electrical Engineers in the Institute's Standardization Rules as the allowable upper limit for these types of insulation and is recognized as conservative.

## Reduction of Costs

"Continuous rated" electrical equipment—as differentiated from "fractional capacity" or "overload rated"—designed for operation at temperatures closer to the allowable upper limit than has been considered good practice in the past, is so designed for one major purpose, to eliminate excess or unnecessary materials and thereby reduce the cost. Any advance in our art which offers an opportunity to truly conserve—to make a quantity of materials do equally well what formerly required a larger quantity—is worthy of most serious consideration and wholehearted support.

Such an advance frequently constitutes a step from that which has been an extremely conservative practice to one which is relatively radical—which has not the same margin of safety. A suitable margin of safety is essential in all engineering practices, but too great liberality in such matters is nothing short of sheer waste. Providing larger amounts of copper, steel and iron than would otherwise be necessary, in order to obtain operating temperatures materially below 105° on equipment having fibrous insulation, is in this sense a definite waste.

Generators in which the same class of insulation has been used have, for several years, been designed with this in mind, and the wisdom of thus fully

utilizing the material entering into the construction of these units is generally conceded. European practice has inclined, during the same period, to the carrying of this idea into other lines of electrical equipment—notably into motor construction—and with very satisfactory results.

## Rating and Capacities of Motors

From the time motors were first produced commercially until the present, they have practically all had overload capacities and the nominal rating of a unit did not at all show what load the machine could carry with safety. Many old units, designed and built at a time when knowledge of materials and applications was relatively limited—when applications were largely made by "rule of thumb," rather than by suitable investigation and analysis—would carry, and in some cases are still carrying, continuous overloads of as high as 100%. As knowledge of materials and applications increased, newer designs of motors had their overload capacities reduced little by little until a sort of standard of 25% overload for 2 hours was brought into general use and is still in extensive use.

Where extremely high duty peaks, coupled with speed variations covering a large range, are to be experienced (as for instance in hoist work), or in cases where motors are to be operated for very short periods and then allowed to stand idle or run lightly loaded for appreciable intervals, continuous ratings expressed in horsepower would have but a limited bearing on either the work to be performed or the capacity of the motor under the various conditions of speed and torque which would be required. Special ratings covering the required characteristics may, therefore, logically be used in such cases. Even in equipment of this kind every endeavor should be made to avoid too great conservatism in the matter of operating temperatures. There is no more necessity for operating insulations of intermittent rated motors at maximum temperatures materially below the accepted upper limit than there is in the case of continuous rated units.

## Maintaining Idle Equipment

Aside from very special cases, such as those above mentioned, the great majority of all applications fall into what may be termed the general purpose class. The requirements of this class are best met by continuous rated machines both from the standpoint of the users and of the power companies. Power company and power user have each a decided

DAVE HARRIS says: "Non-attendance at convention will cost you several thousand dollars."



interest in this matter and this interest is one which affects the pocket books of each.

In the cases of many of the older types of motors, that is, those having overload capacities, a minimum or service charge made by the power company, and based on the nameplate or nominal rating, is inadequate where a user employs the real capacity of the motor.

The power company, knowing of the overload capacity of such a motor, and having no assurance that such capacity is not to be utilized, finds it necessary, in protecting its system equipment from damage due to overload and in insuring the maintenance of power service conditions of voltage, frequency and available power at the utilization equipment of its customers, to supply capacity to meet the maximum load which the motor might impose. This calls for generating station equipment, transmission lines, step down transformers and distribution equipment—capacity in every part of the system from the source of power, whether it be water or steam, all down the line to the service wires connecting with the motor terminals. Meanwhile the minimum charge (or the service charge), which supposedly covers the fixed expenses incident to these "readiness to serve" items, is based on the nominal rating of the motor instead of on its real capacity.

Data compiled from tests made on approximately 3300 motors connected to the lines of three of our largest power companies in this district indicates very clearly the amount of idle equipment which the utility company is called upon to maintain for loads which might be, but seldom are, carried. 80% of the 3300 installations carried 75% of rated load, or less, 10% carried full load, and 10% carried overload. The overloads ranged from 1 to 13%. The sum of the maximum demands on one of these systems, involving 743 plants with nameplate ratings aggregating 8353 hp. connected, was 7737 hp. Note that this is the sum of the maximum loads and not merely the sum of the average loads, nor of the coincident loads. These readings were practically all taken from centrifugal pump installations during a season of relatively high water table. They are, therefore, undoubtedly higher than average seasons would show, as the centrifugal pump requires increased power with reduced working head.

#### Adjusting Equipment to Loads

This class of work has quite obviously been overmotored in the past, and the overload margin has rarely been called into play. Such being the case, why use fractional rated units? Why not apply motors of the correct size and designate them by their true capacities? The user would in this way secure equipment at a smaller expense per horsepower and the company would be enabled to lay out and install its system equipment on a basis of known maximum loads, thus laying the basis for securing equitable remuneration for the outlay involved. If overloads must be provided for in a given installation, suitable motor capacity should be purchased and should be plainly indicated in the motor rating. No rating should camouflage the capacities of the unit which it covers. The natural result of using

continuous rating will be, to a considerable extent, the elimination of over-motoring, as the consumers will find it to their best interests to keep down minimum or service charges by putting in equipment which will be fully loaded.

A power user requiring approximately 25 hp. for duty on a drive on which he expects at times to face the minimum charge, or where the "service" charge is based on the nameplate rating of the motor, will purchase a 25-hp. motor and not a nominally rated 20-hp. motor with a margin of 15% or 20% horsepower expressed in overload capacity, nor yet an old motor rated 15-hp. but capable of carrying 50% to 100% additional load. Such purchasing of units with heavy overload capacities has been resorted to in order to secure low minimum charges (or service charges), but the practice is quite evidently unfair.

#### Continuous Rated Motors

The use of continuous rated motors eliminates much of this sort of thing. A purchaser will get full value for his expenditure—will secure a greater horsepower capacity for a given expenditure—will secure a motor of the horsepower he orders and not a unit which is rated a given amount and capable of a questionable amount more—will not be required to purchase overload capacity which he does not wish to use—will get a rate from the power company which is based on his actual power demands,—all of which is incontrovertibly fair. The power company will furnish and maintain the necessary generation, transmission and distribution equipment to supply the required power as designated by the motor nameplate—not 15% to 100% more than is so indicated—and for this reason feels more certain that the return in service charges (or minimum charges) is commensurate with the cost involved. In short, the business agreement between power company and user will be established on an equitable basis, each receiving what is fair, thus building up mutual confidence which is so essential to stable business relations.

Any step which involves a somewhat radical departure from existing practices has many well-meaning objections raised against it. It is good that such is the case, as constructive criticism is an invaluable factor in stabilizing all such matters. All such objections or criticisms will be upheld or discarded depending upon their correctness, or incorrectness, as the case may be, when viewed in the light of facts as they develop. The most commonly voiced objection to the use of motors designed to operate normally at higher temperatures is that the high atmospheric temperatures (ambient temperatures) in our interior valleys, together with the unavoidable load changes incident to some types of drive—notably on pumps operating against heads which vary quite widely with seasonal and yearly changes in water table—render a large margin of safety, such as obtained in the 25% overload rated motors, absolutely essential. A most convincing answer to this contention is that one manufacturer sold approximately 1800 continuous rated motors in California during the year 1919. Fully one-half of these units were operated through the past summer, most of them being applied to pump drives in the valleys, and no



greater percentage of trouble has been experienced than where the overload rated type of machine was used, and the total number of motors involved in all troubles is but a fraction of one per cent of those which were put into service. This holds in spite of the fact that most of these units sold for pump drives were applied by men who were not especially trained in electrical matters but who used the same general methods and margins in computing sizes of motors for the drives as they would have used in applying overload rated machines.

This is the acid test, involving the most serious of the objections which critics of the practice of using continuous rated machines have raised. These critics have said that in order safely to apply continuous rated motors, the service of expert electrical and mechanical engineers would be required in the case of each application, the former to fully diagnose electrical conditions and the latter to accurately predetermine load requirements. They have also said

that low ambient temperatures are imperative and that not even the slightest interference with perfect ventilation and radiation could be permitted without danger.

In answer to this we have the facts that the loads imposed by such pump drives were not susceptible of extremely close predetermination as to magnitudes—the ambient temperatures were high (in many cases over the 40° C. used as a reference base in the A. I. E. E. rules in computing permissible rises); loads were calculated as to value by men not particularly experienced in electrical matters and who did not make any special allowances for the new type of units; motors were often installed in places where dust and other materials interfered with perfect ventilation and radiation of heat—and the motors did the work in a thoroughly successful manner. The actual performance of these units leaves no doubt as to the entire practicability and desirability of using such equipment in general work.

## Standardization of Titles

BY A. B. CARPENTER

(The following report to the Pacific Coast Section N. E. L. A. Convention, by the auditor of the San Joaquin Light & Power Corporation, takes up the question of salary cost per consumer with reference to exchanges of statements between companies, and the type of standardization which will make the exchange effective.—The Editor.)

In committee meeting, among other subjects discussed, the question of Commercial Department salary cost arose. This was brought about through the fact that our respective concerns have from time to time exchanged statements of such. This is confined, however, to that branch of the Commercial Department generally known as the Consumers or Consumers Department.

In comparing these costs, it has been found that it is rather difficult for the various companies to render such data, on a comparable basis. The title (Standardization of Titles) really introduces a very much more extensive subject than was contemplated by the committee, the purpose being at this time to confine our remarks to the department named.

Although the accounts affected are few, in order to arrive at the salary cost per consumer, it is necessary to classify further the help whose salaries are charged to the following accounts of the uniform classification:

- E 62 Commercial Dept. salaries
- E 63 Commercial Dept. indexing
- E 64 Commercial Dept. collection
- E 65 Commercial Dept. miscellaneous

The above accounts are more commonly understood as

- Consumers Dept. salaries
- Meter Readers Dept. salaries
- Collection Dept. salaries

These should be subdivided into the following units, which furnish the basis for a comprehensive statement of comparative salary cost:

- A Meter readers
- B Bookkeepers
- C Counter clerks
- D Collectors
- E Department head

Classification under these units then would be:

- A. Meter readers
  - Meter readers
- B. Bookkeepers
  - Ledger or register credit posting clerks
  - Ledger or register debit entry clerks
  - Service order, etc., entry clerks
  - Billing clerks
  - Miscellaneous clerks
- C. Counter (exclusive of other than strictly consumers' accounts)
  - Complaints
  - Service orders, etc.
- D. Collections
  - Dept. head or chief collector
  - Stenographers
  - Clerks (mailing, routing, etc.)
  - Collectors
  - Window cashiers
- E. Department head
  - Head of Consumers' Dept.
  - Stenographer
  - Clerks (not directly employed on foregoing).

It may be well to mention here that the data used in the preparation of such a statement would have to be gathered from the large centers, such as San Francisco, Los Angeles, Fresno, Riverside, Pasadena, etc., for the reason that in the smaller offices, very few employes do a varied line of work, and therefore each company would find it difficult to segregate the costs on the same basis.

While it does not represent the magnitude or possibilities of the title, it is to be hoped that this little paper does suggest the basis upon which the various electrical utilities of the state may be benefited through the exchange of statements.

W. D'ARCY RYAN says: "Illumination is vital. Convention will be illuminating."



# Analyzing Unelectrified Possibilities in California

BY J. O. CASE

(The saturation point for the use of electricity instead of coming nearer moves continually farther off with the widening of the field of electrical development. In order that all branches of the electrical industry may have facts, figures, and estimates on which to work in planning for the future, it is suggested that unelectrified possibilities should be analyzed and tabulated. The following paper, presented to the Pacific Coast Section N. E. L. A. Convention under the title "Some Suggestions For the Analysis and Tabulation of Unelectrified Possibilities in California," is by the local sales manager for the General Electric Company at Los Angeles.—The Editor.)

We are told by Mr. D. B. Rushmore, who has, perhaps, given more study to the question of electrification of industry than any other engineer, that the average man of 154 pounds, without clothing, expends approximately 65 calories of energy an hour while sleeping. When he is standing at rest the same man expends 100 calories; typewriting 140 calories; carpentry 240 calories; industrial painting 240 calories; walking actively 240 calories; stone working 400 calories; sawing wood 480 calories; running 500 calories; and severe exercise of almost any nature about 600 calories. He says further:

"This hourly expenditure of energy by the average size man, though it is but approximate, has a distinct and interesting bearing on whether and how this energy can be replaced by a machine in order that the man may be turned to other labor. This point is emphasized over and over again when one sees many men doing what a few machines could do. It is evident that if a man expends, say, 250 calories of energy doing something which could be more efficiently accomplished by a machine, his employer saves 250 calories of human energy by substituting the mechanical device for the human workman, and this permits the man to be used in a way that is more profitable both to himself and to his employer.

"This is certainly the age of power. In 1890 the total horsepower produced by electric motors in the manufacturing industries of the United States amounted to 15,569. Nine years later this aggregate horsepower had been increased to 492,936. Five years later the total had reached the astonishing figure of 1,592,475 horsepower, and in another five years the total had become 4,817,140. Today, without definite figures available, a conservative estimate would place the horsepower produced by electric motors at about 9,000,000. If nothing else were needed this surely is an indication of the ever-growing importance of the increased production resulting from the substitution of machines for men.

"For example, let us take a specific instance—the steel industry. During a period of ten years the primary horsepower used increased from 1,649,299 to 2,706,533, while the electric horsepower increased from 254,258 to 1,207,715. On the other hand the number of wage earners in the industry increased from 207,562 to only 248,716. During the same interval the production of steel in tons increased from 13,670,592 to 23,403,957. Analyzing these figures we find that the primary horsepower increased 64 per cent and the electric horsepower 475 per cent. The wage earners increased 20 per cent, and steel production increased 71 per cent; that is to say, the increase in the number of wage earners of 20 per

cent brought about an increase in steel production of 71 per cent, which larger production resulted principally from the great increase in the use of electric motors. Without doubt similar conditions exist in most other industries."

## Visualizing the Goal

It is one of the laws of metaphysics that all achievement depends upon vision; it is necessary that we should see at least the outlines of the things we propose to accomplish; the fuller in detail this mental picture is the more likelihood that we shall be able to realize it.

Even the most optimistic would hardly dare prophesy the possibilities for development of the electrical industry in California in the next few years. The purpose of this paper is to outline briefly one of the greatest opportunities before the Pacific Coast Section, N. E. L. A., for constructive effort. Just at the present time the central stations are all so busy trying to find power with which to supply their consumers, the manufacturers and jobbers are trying to make their stocks meet the abnormal demand, the contractor-dealers are so busy taking care of the business that is forced upon them, that none of these interests have had time nor felt the need of looking to the future or of making preparation for the time when this condition may be changed.

Hydroelectric development is going forward at a tremendous rate. Definite plans are laid for years in the future. But who can tell from the data at hand what the demand for power will be before this program is completed? Basing it upon the growth in the past and adding a percentage for future increase does not, by any means, tell the whole story.

To carry forward power developments requires enormous capital. In order to interest capital it would be of great value to the public utilities to know approximately what the power demand will be for the next few years. Not simply the demand which may result from normal growth, but rather the demand resulting from the intensified development of the industry, based upon a fairly accurate analysis of its ultimate possibilities, or saturation point, with all branches of the industry working toward this goal. This information would be of great value to the manufacturer and jobber in assisting them to plan on stocks, warehousing facilities and sales efforts. The contractor-dealer would also profit by such information.

Is there any fairly accurate way of analyzing the possibilities for electrical development and tabulating the results so that the data may be of practical value to the industry? The work is so broad in scope and has so many angles and factors to con-



sider that only a few examples can be cited in a paper such as this. But it is hoped these will create sufficient interest in the subject so that the Pacific Coast Section may formulate some definite plan for carrying on this important work.

### The Beet Sugar Industry

A brief analysis of the beet sugar industry in Southern California is an interesting example:

There are in Southern California seven sugar factories. They have a combined capacity of 10,000 tons of beets per day. As the duration of the ordinary sugar campaign is 100 days it will be seen the seasonal beet capacity of the seven factories is 1,100,000 tons. To produce this beet tonnage requires 110,000 acres. This past season only 50,000 acres of beets were planted, or less than half the factory capacity. As a result only five factories operated, and these on short campaigns.

The immediate need, therefore, is not for more sugar factories, but to encourage increased acreage in beets. The power necessary to irrigate the maximum of 110,000 acres is 15,000 hp. The amount of power used in 1919 was 7500 hp. The average irrigating revenue is \$12.00 per hp. Therefore, whereas the irrigating revenue from the sugar beet industry in 1919 should have been \$180,000 it was only \$90,000. The total power required by the seven factories is 10,000 hp. At present only about 50% of this is electric. Here is an immediate prospect for the development of 5000 hp. in electric drive in existing factories, plus the possible addition of 7500 hp. required to irrigate beets sufficient to give the existing factories 100% load factor. This is an accomplishment worth working for. Incidentally, with the present sugar prices, increasing production 50%, aside from the increased use of electricity, would be a very worthy and patriotic undertaking.

### Oil Field Electrification

There has undoubtedly been more activity in the application of electricity to the production of crude oil than in any other line of industry in the past few years. This has been due to two important factors: ease of transportation, and economy of operation. Electricity has permitted the wildcatting of territory so inaccessible that it would have been left unexplored had it been necessary to depend upon the transportation of steam equipment and its subsequent expensive maintenance.

The average cost of electricity for all of the operations about a standard cable tool rig runs about \$250.00 per month for a 3500-foot well, or a daily average of \$8.50 per 24-hour day. Contrast with this a cost of from \$20 to \$25 per day for fuel oil alone, not including its transportation cost, and the economy of electric operation is at once apparent.

Again, the cost of electricity for drilling a 3500-foot well by the rotary process, which necessitates the use of nearly twice as much installed horsepower as standard cable tools, averages from \$275.000 to \$325.00 per month, or a daily average of \$10.00 per 24-hour day, against a comparative cost of from

\$800.00 to \$1,000.00 per month or \$25.00 to \$30.00 per day for fuel oil operation.

Add to the above that the installed cost of electric drilling equipment is considerably cheaper; its depreciation but a small percentage; its operation considerably more simple and reliable; and its productive ability considerably greater than that of steam, and the reason for the present activity is explained.

The same arguments given above for drilling will apply with equal force to the pumping and refining of the oil. When it is remembered that it is the aim of every operator to keep a pumping well on the beam as nearly 24 hours per day as is possible, it can be readily seen that this is not only a steady, but a high revenue producing load. There are at the present time approximately ten thousand pumping wells in California, of which approximately 2800 are electrically operated, either individually on the beam, or in groups on power jacks, showing that only a small percentage are electric driven. This is due to many causes, not the least of which has been the scarcity of electric energy for such application, due partly to the lack of rain during the past two years, and partly to insufficient developed resources. There are several hundred wells, each of which would require a maximum of approximately 30 horsepower, which could be immediately electrified were the energy available. In addition to this unelectrified horsepower there is a possibility of enormous development in electric precipitation for oil refining.

### Elevator Operation

With the present cost of fuel oil the operation of steam driven hydraulic elevators is no longer economical. The substitution of electric drive for the pumps is entirely practical and offers possibility of a great saving in power cost. No tabulation of the possibilities in this field has been made, but it offers a very interesting example of unelectrified horsepower.

### Power Possibilities for Irrigation

Mr. A. W. Childs, superintendent of sales of the Southern California Edison Company, estimates that in the territory immediately under the lines of his company and its subsidiaries there are approximately 1,000,000 acres, in addition to those already under irrigation, which could be irrigated from pumping plants. An average sized motor installation would be at the rate of .4 hp. per acre. This addition of 400,000 hp. connected load would interest all of us in the industry.

An analysis made by Mr. C. Remschel, commercial agent of the Southern Sierras Power Company, of the irrigable lands under their system discloses the fact that there are 1,210,000 acres, requiring annually 403,000,000 kilowatt-hours. This would require a generating capacity of 80,000 kva. This estimate is based upon a conservative figure of 2 acre feet of water per year, and does not include the land that is now being irrigated or that which can be irrigated by gravity.

GEORGE ELLERY HALE says: "A great quantity of energy comes from the sun. There is plenty of sun at Pasadena."



We have the authority of the United States Geological Survey that in San Diego county the potential demand probably exceeds that of any other settled part of the state.

In 1914 there were 24,589 pumping plants in the state, irrigating approximately 700,000 acres. The total area irrigated from surface and ground waters in California was in that year approximately 3,200,000 acres.

The following table shows the area of agricultural land, of irrigated land and the estimated area that will ultimately be irrigated in Southern California, as of 1912:

	Agricultural land Acres	Irrigated land Acres	Estimated area that will ultimately be irrigated Acres
Santa Barbara and Ventura Counties.....	509,250	49,656	322,500
Los Angeles and San Gabriel river lands	441,986	167,454	381,500
Santa Ana river lands.....	876,671	213,407	279,000
San Diego Co. ....	363,668	19,880	87,100
Colorado Desert and River Valleys.....	1,550,760	279,600	766,500
Mojave Desert .....	2,328,000	15,489	113,000
Totals.....	6,070,325	745,486	1,949,600

The data for the year 1912 has been very carefully compiled in Bulletin 54 of the United States Irrigation Investigations Office of Experiment Stations, U. S. Department of Agriculture. The bulletin was prepared by Mr. Frank Adams and Mr. Adams' office is now bringing the 1912 data up to date in connection with the United States Irrigation Census, but the data will not be available for a year or so.

In determining the power possibilities from irrigation, a number of deciding factors must be considered, among which the following are the most important:

- (a) Head to be pumped against
- (b) Crop
- (c) Climatic conditions
- (d) Soil conditions
- (e) Personal equation
- (f) Market conditions

**(a) Head to be pumped against:** This is a variable quantity, depending upon the location, and varies anywhere from ten to several hundred feet; however, in Southern California, the average variation is from 50 to 150 feet. The current consumption varies practically in direct proportion to the head that the water has to be pumped against. In other words, it takes practically twice as much power per acre with the same crop when pumping against a head of 100 feet instead of 50 feet.

**(b) Crop.** The amount of water required varies with the crop; in other words, alfalfa requires practically twice as much water as citrus or deciduous fruit. The usual amount of water required is from 300 to 500 times the weight of the harvested crop. For instance, if one acre of land yields ten tons of alfalfa, it would require from 3,000 to 5,000 tons of water. The following table gives the approximate water requirements for different crops. From this should be deducted the rainfall in the various locations where the crops are to be raised.

Alfalfa	3½ to 5 acre feet
Citrus fruit	2 to 3 acre feet
Deciduous fruit	2 to 3 acre feet
Beans	1 to 2 acre feet
Beets (sugar)	2½ to 4 acre feet

Potatoes	1 to 2 acre feet
Rice	2 to 3 acre feet
Cotton	2 to 3 acre feet
Walnuts	1 to 2 acre feet

**(c) Climatic conditions.** The amount of water required varies with the climatic conditions in locations such as the Coachella and Imperial Valleys, where the temperature in the summer time is extremely high, with very little precipitation, a great deal more water being required for the same crop than if it were near the coast, where the climate is cooler and with more precipitation.

**(d) Soil conditions.** This is also a large factor in determining the amount of water required for irrigation, differences in soil quite frequently, with the same crop, having a variation of as much as 100%. Loose, sandy soil, not having a hardpan underneath, takes practically twice the water that a heavy, loamy soil would require.

**(e) Personal equation.** This personal equation is perhaps more important in water consumption than is at first apparent, but it is surprising what influence it has on water consumption. Experience has shown us that while one man with a certain piece of alfalfa land is satisfied with 2½ acre-feet of water and conscientiously thinks this sufficient, the next owner of the land thinks he must have at least five acre-feet.

**(f) Market conditions.** The amount of water used depends quite largely on the market conditions or prevailing price of the crop raised. For instance, when the price of alfalfa is high the crops are forced and a much larger quantity of water used than when prices are so low as to make the cost of irrigation a large factor in the production cost of the crop.

The above facts are brought out to show how impossible it is to have a fixed rule which can be applied in every case, showing the amount of business in the way of kilowatt-hours sold and revenue available from a certain piece of land, when the lift and crop are known. However, the following table will make it easy to figure this out by first determining the number of acre-feet required, and then by multiplying this by the cost per acre-foot, shown in the table under the varied lifts from 50 to 200 feet. The cost is based upon current at 2c per kilowatt-hour.

	KILOWATT-HOURS REQUIRED, AND COST AT 2c. PER KW-HR. TO PUMP ONE ACRE-FOOT							
Head in feet,	50 ft.	15 ft.	100 ft.	125 ft.	150 ft.	175 ft.	200 ft.	
Kw-hr. required,	100	151	201	251	302	351	402	
Revenue,	\$2.00	\$3.02	\$4.02	\$5.02	\$6.04	\$7.02	\$8.04	

#### Supplemental Farm Uses

What may be termed supplemental uses for electricity on the farm, aside from the main use for irrigating, present an enormous and immediate field for electrification with but very little additional cost for service on the part of the central station. With the lines and transformers already in, the load can be materially increased by the addition of electric ranges, food choppers, cream separators, milking machines, incubators, brooders, and a variety of motor applications which will prevent the misuse of energy on the farm as truly as in industrial processes.



### Industries

It must not be supposed that all of the industrial activity which the Pacific Coast experienced during the past few years was directly chargeable to the war, for it cannot be denied that the Atlantic Seaboard has nearly reached the saturation point so far as available industrial sites are concerned.

Furthermore, the discovery that such crops as cotton can be commercially produced in the West, has given a tremendous impetus to the establishment of industries depending upon the raw material for their manufacturing processes.

As the advantages of geographical location providing cheap water, transportation to both eastern and foreign ports, more stable labor conditions, better climatic conditions, etc., become better known through the medium of our winter influx of tourists, we can expect a very stable growth in our industries, and since such industries require considerable power any successful effort spent in attracting them to our midst is effort that will produce highly profitable results.

Some very interesting figures are obtained from the government on the power requirements of some of the more important industries, which are valuable from the standpoint of future business.

Industry	Primary Horsepower	Electric Horsepower
All industries, except mining.....	22,547,574	8,847,622
Agricultural Implements .....	121,428	83,117
Boots and Shoes .....	112,929	61,657
Bread and other bakery products.....	107,771	86,779
Brick, tile, pottery and other clay products .....	470,758	95,080
Butter, cheese and condensed milk.....	130,862	23,061
Canning and preserving.....	120,004	28,438
Car shops .....	433,994	325,054
Cement mills .....	490,402	336,516
Confectionery .....	55,823	36,941
Cotton goods .....	1,585,953	512,903
Fertilizers .....	114,281	65,266
Flour mills .....	822,384	150,248
Foundry and machine shop products.....	1,129,768	896,894
Ice and refrigeration .....	461,988	50,546
Lumber and timber products.....	2,796,902	306,540
Mining .....	4,699,910	723,727
Petroleum refining .....	128,468	88,614
Printing and publishing.....	235,210	283,206
Salt manufacture .....	29,007	7,742
Slaughtering and meat packing.....	260,996	122,956
Sugar, beet .....	76,705	17,871
Sugar, cane .....	113,246	2,769
Sugar refining .....	49,666	24,016

The above comparison covers only the possibilities from the motor standpoint. There exist in many of these industries the almost untouched field of electric heating, arc welding, rivet heating, japaning ovens, glue pots, solder melting pots, hardening furnaces, reduction furnaces, ovens for bakeries, and a thousand other applications. Only by an analysis of these industries can any idea be obtained as to the ultimate possibilities.

Assuming that there is a place for an electric motor wherever there is a machine to be driven and electric heating wherever there is a process requiring heat, almost every industry offers great possibilities for increased electrification, as the foregoing analyses of a few industries demonstrated.

Nowhere does President Wishon's Self-Interest Idea fit in better than in this question of unelectrified horsepower. It is a matter of vital importance to the entire electrical fraternity.

To expect ever to reach the saturation point is out of the question. Not so many years ago we thought that with every house wired and using carbon lamps, we had done a pretty good job; but those installations of wiring, insufficient as they are to present day needs, are not yet anywhere near loaded, much less are the up-to-date installations which provide for the use of every possible electrical convenience. We may think when we have placed a vacuum cleaner in every household we will have about reached saturation on that device, but when that time comes we will probably find that the standards of cleanliness have been raised to the point that require the use of the device every day instead of once a week, just as the load factor has increased on the bath tub.

The central stations have done more or less investigation of unelectrified horsepower, which has been in the nature of taking care of business already established or in sight, rather than an analysis of the possibilities for electrical development, or as it may be termed, research work. A start should be made now to work out a definite plan of analysis and tabulation of the unelectrified possibilities by the industry as a whole.

To attempt at the present time to make an analysis which would cover, say, the next ten years, is obviously impossible. One immediately gets into the realm of guesswork, where one man's guess is about as good as another's. We have, however, the first point of the curve, which represents the present connected horsepower. By estimating the next point, which would represent the present load plus the unelectrified possibilities for the next year, and at the end of the year plotting the actual increase for comparison, gives us a fairly accurate idea as to what we are doing. After we have established three or four points on the curve in this manner we can then make an intelligent forecast as to what we may reasonably expect the curve to look like over a period of years, just as it is possible in stream measurement to establish a basis for hydroelectric development.

It is suggested that, owing to the magnitude of the undertaking, if it is attempted to cover the entire field of possibilities, that this work be confined for a time to a few of the more important fields such as, for instance, irrigation, industrial electric heating (including electric welding and reducing furnaces), replacing of steam driven units which are uneconomical due to present fuel costs. With this in mind it is the recommendation of the Commercial Committee to the Executive Committee of the Pacific Coast Section, N. E. L. A., that this research work be undertaken, preferably as one of the activities of the Advisory Committee of the California Electrical Cooperative Campaign; that the work be carried on from year to year so that some adequate idea may be formed and definite steps taken to reach as near as possible the saturation point in the electrical industry.



## Relay Protective Systems

BY G. E. ARMSTRONG

(Protective relays are very important adjuncts to any transmission system of great extent and as such have received particular attention in the West. The following engineering committee report, is prepared for the Pacific Coast N. E. L. A. Convention by the former protection engineer for the Southern California Edison Company, who is at present Associate Editor with the Journal of Electricity.—The Editor.)

The sub-committee on relay protective devices have deemed it advisable to confine their report this year to a discussion of the more theoretical phases rather than to a discussion of the actual relay equipment in service.

The first phase to be considered is that of the definition of an interruption as applied to a transmission system.

It is very difficult to define an interruption in such a way as to make the definition applicable to all transmission and distribution systems unless a general understanding as to the meaning of certain terms is agreed upon. The diversified character of loads on different systems and the consequent difference in the exactions imposed on various public service companies as regards the allowable range of frequency and voltage are such as to make what would be classed as an interruption on one system and something less severe than an interruption on another. Moreover, on any particular system it is probable that in recording disturbances such terms as partial interruption and total interruption are used. It would appear desirable to have a more uniform understanding in the use of such terms.

A short circuit of sufficient severity to pull the voltage and frequency down to a point where all, or nearly all motor load is dropped, is practically a total interruption as far as service is concerned, but if a sufficient number of generating units remain on the line until the short is cleared, the practice of some companies is to term such a disturbance a partial interruption. Possibly some definition of an interruption can be agreed upon whereby a deviation from normal voltage and frequency by a certain percentage and for given lengths of time would be considered an interruption, at least technically if not in fact.

At this point it is well to point out that the present standard to which the voltage and frequency may drop and thereby cause the motor load to be lost is one which may be changed in the very near future, due to the adoption of more sensible protective devices for such loads. At the present time the general protective devices, and in fact the requirements of the state, are that these motors be equipped with no-voltage releases which operate on 50% or 75% decrease from normal voltage. The adoption of such devices as thermostats or others which operate only on low speed would replace the present no-voltage release system.

The isolation of a branch circuit by the action of an oil circuit breaker is commonly understood to constitute an interruption on that particular circuit, but with the exception of such a well defined and unquestionable case, there is a likelihood that interruptions less positive in effect will be classified in various ways by different operating men.

This, therefore, is a question which should be satisfactorily disposed of, and it is the opinion of the committee that encouragement should be given to the determination of characteristic curves for the protection necessary in such industries as textiles and paper manufacturing. Other industries such as smelters and important mine pumps suffer great losses in cases of interruption, and these separate services will of course require and justify greater expenditures for protection and selective operation of switches, particularly where service is given over more than one line, than will the ordinary loads where short interruptions are of no particular importance other than the inconvenience incident to starting up again.

Considering a given system or certain divisions of a system, it is possible to ascertain with reasonable accuracy how long it takes to restore service after an interruption occurs. And it is also possible to determine the length of time elapsing between the restoration of service and a condition normal load. Thus the loss in kw-hr. output can be arrived at, the problem being more or less complicated according to the amount of testing necessary to locate the section in trouble, arrangements of circuits, ease of transferring loads, etc.

This makes it possible to place valuation on the interruption so far as the loss per kilowatt-hour output is concerned, but when it comes to expressing in terms of dollars and cents, the loss in good-will, satisfaction of consumers and standard of service, it is almost impossible to use this very important factor in sustaining a recommendation for expenditures for the purpose of bettering the service by lessening the number and length of interruptions.

One further point of great timely importance in the application of protective relays to high tension transmission systems is the use of bushing type current transformers. The use of current transformers designed for use directly at line potential and having separate bushings and containers is an expense which may in some cases prohibit the installation of the type of relays deemed more satisfactory. And for this reason the use of bushing type current transformers is gaining attention where relay action only and not metering of energy is desired.

It is desirable to have more data at hand regarding the characteristics of current transformers of this type and the resulting action when used in connection with relays of modern design. The small secondary current at the voltages generally in use for transmission has been one of the serious difficulties in the way of the successful application of bushing type current transformers, where it has been desirable to have the circuit breakers operate on comparatively small kva. values. While this is an



inherent weakness of the bushing type current transformer with its single primary, it is somewhat obviated by the use of two bushing type current transformers per phase, but even at that a considerable amount of primary current is necessary to insure relay action.

This is a problem not only for the manufacturer of the bushing type current transformers to consider, but one also for the manufacturer of the relays. It is necessary for them to produce relays which operate satisfactorily on very low values of current. At the present time the standard induction type relays will only begin to operate on about four amperes in the relays. They should be capable of adjustment so that operating may be had at as low values as one ampere flowing in the relays.

In general, the committee feels that the general proposition of relay protection has gained considerable impetus in the West during the past year,

and for the coming year it is planned to exercise greater cooperation between the N. E. L. A. and the A. I. E. E. The American Institute of Electrical Engineers has a very active protective devices committee, which among other activities is planning to gather together and have for reference in some central location, or for distribution to the interested companies, a file of all the kinds of protective relays which have in the past been developed, and to keep careful track of new developments as they are made. In this way it is hoped to prevent the duplication of work by investigators in different parts of the country.

It is felt that the Pacific Coast Section of the National Electric Light Association would be justified in giving more attention to cooperation with such important committees of the Institute and the step mentioned is being taken toward that end.

## Progress Report on Suspension Insulator Deterioration

BY J. A. KOONTZ

(Suspension insulator efficiency is a subject which is still to a great extent in the experimental stage, and of especial interest to the West in connection with the rapid extension of transmission lines. The following report by the chief electrical engineer with the Great Western Power Company gives interesting data and figures compiled from his committee's investigations for the Pacific Coast Section N. E. L. A.—The Editor.)

Since the last Progress Report under date of March 12th, 1918, some 767 units have been subjected to an average of 750 days of yard and basement treatment. It will be remembered that the yard treatment consisted of simply letting the insulators be exposed to the elements in the laboratory yard where the sun, rain, fog and damp ground at certain periods of the year all seemed to combine to find the faults, while the basement treatment consisted of storage in the basement, where the units were naturally protected from the elements, and were subjected to very little temperature change either in the daily or seasonal cycle.

The present results tend to emphasize several points which were more or less clearly pointed out from previous tests. The majority of suspension insulator failures, especially among units manufactured during the last six years, have been due to temperature changes; voltage duty and loading in most cases have very little effect. From the table, it will be noted that insulators 1-13A, L. A., B. L. and S, after some four years of yard treatment following their previous service record, show a rate of failure of from  $12\frac{1}{2}\%$  to 15% per annum for the four year period. This test checks with what has been found in service with the same class of insulators on our Western transmission lines.

### Effects of Temperature

It is also interesting at this point to note that where insulators of the class mentioned above were placed in even temperature storage, the rate of depreciation was very materially reduced and in some cases was negligible. For example: The 1-13A Class

insulators over a 750 day period were failing at a rate of 43.8% under yard treatment, while the rate of failure under basement treatment was only 4.35%. With the L.A. insulators the failure under yard treatment was 36.8%, while under basement treatment the failure was 0%. The B.L. class failed under the last period of yard treatment at 47.4%, while under basement treatment the failure was only 9.52%, while the S lot has a failure under yard treatment of 29.4% and a failure under basement treatment of 3.85%.

From the table it will be noted that under the first period of basement treatment, the percentage of failures between yard and basement treatment was not very pronounced, but after a two year continuation it was quite pronounced. This basement treatment will help clear up to a large extent the reason why insulators installed in stations have given good service, while the same units installed on the lines have been the source of a great amount of trouble.

It is also of interest to note the difference between L.A. and B insulators. Both were manufactured by the same Company, the one in 1912 and the other in 1916. One shows a 60% depreciation in four years of yard treatment, and the other no depreciation. These facts are borne out by practice as well as test, as insulators made even in 1914 of the B class show no depreciation after over five years of line service, while insulators made one or two years prior to that time show a depreciation of from 6 to 10% per annum under service conditions.

The record of insulators marked G is gratifying,



as these units were manufactured in the early stages of the suspension insulator art (1907-8) and saw duty under severe line conditions on 100 kv. circuits up to 1914 when they were removed from the lines and soon afterward sent to the laboratory for test. This insulator is of poor electrical design, having a low margin of safety between flash-over and puncture, and distribution of stress is not well taken care of as in later designed units, thus heavy streamers formed under flash-over conditions which in general cracked the porcelain bodies from excess heating. In spite of these defects, however, these insulators show only a 3.6% depreciation during the four years of yard treatment. It must be remembered that these units are the old cap and stud type using cement. The surfaces are untreated, no gaskets or yielding material having been used in their assembly. This simply emphasizes the fact that a high grade of porcelain is more essential in the suspension insulator than good electrical design. Also, it points out the fact that with proper care, good life can be obtained from insulators of the cap and stud type.

It is with regret that we notice that insulators of Type H made in 1916 by the same manufacturer as the G group, show a much higher rate of depreciation. It is true that only a few samples were treated in this case, but we have access to the records of transmission lines where they are in use, and these two records tend to show the relatively greater merits of the units manufactured by the same Company eight years previous. In other words, the early units were far superior to those made at the later date.

Another point clearly brought out by the tabulated results concern insulators marked F. These units were not of porcelain, but of a fused material which is moulded while in the liquid state, and the hardware attached in some cases by cement in the usual manner, and in other cases an alloy was used. As regards the difference between cement and alloy, the results would indicate no particular preference,

but it is clearly pointed out that any material that has a mortality of over 50% in two years of yard treatment is either unfit for the service, or the insulator is of improper design.

The results taken as a whole, seem clearly to indicate why insulators next to the tower in suspension strings, and those used at dead-end positions have a higher rate of depreciation than other units. That is, these particular units pass through a greater daily and seasonal temperature range than the other units, as the unit next to the tower in suspension is a sun-shade for the other units. In the stations, the insulators are protected both from the extreme temperature ranges and from absorbing moisture, hence, these insulators give better service, all of which is shown from both laboratory results and from the field.

### Necessity for Special Experiment

All tests to date seem clearly to point out that thermal fatigue is apparently the major factor in suspension insulator deterioration, hence, it seems logical that we should attempt some method to try and develop a test whereby suspension units could be given equivalent aging effect to that of from 10 to fifteen years' service in a comparatively short interval of time.

The Insulator Sub-committee have been giving this matter of thermal fatigue testing considerable thought for several years. The insulator manufacturing companies have generously supplied us with units both with hardware and without for making such tests, and when it is seen that insulators of one type manufactured by one company in the early stages of the art are giving excellent service, while those of the same company manufactured some eight years later are giving poor service, and the reverse being true of another manufacturing concern, it seems that the member companies should be sufficiently interested in this work to finance the project. It might be of interest to know that the cost of financing this test would be less than 1/2 of 1% of

LELAND STANFORD JUNIOR UNIVERSITY. DEPARTMENT OF ELECTRICAL ENGINEERING													
SUSPENSION TYPE INSULATOR TESTS.													
Series	A	B	C	D	E	F	G	H	I	J	K	L	Total
Date of Manufacture	1912	1912	1912	1916	1913	1917	1908	1916	1916	1916	1916	1912	
Total insulators received for test	74	92	98	58	92	82	59	15	92	47	47	102	858
Failed prior to yard treatment	0	15	19	1	8	13	2	0	0	0	3	11	72
Available for yard treatment Dec 1916	74	77	79	57	84	69	57	15	92	47	44	91	786
Failed after 185 days yard treatment June 17	0	10	21	0	18	5	0	0	2	4	9	24	93
Percentage of failure yard treatment	0	13.0	26.8	0	21.5	7.2	0	0	2.2	8.5	20.4	26.4	
Available for test June 1917	74	67	58	57	66	64	57	15	90	43	35	67	714
Withdrawn from test	0	0	1	0	0	7	0	0	0	0	0	0	4
Continued in yard treatment June 1917	74	64	57	57	66	57	57	15	90	43	35	33	553
Failed after 115 days yard treatment Oct 1917	1	15	10	0	13	4	1	0	1	4	8	12	69
Percentage of failure yard treatment	1.35	23.1	17.5	0	19.7	6.3	1.8	0	1.1	4.3	24.2	36.4	
Started basement treatment June 1917	0	10	9	1	12	2	0	0	0	0	5	32	157
Failed after 115 days basement treatment	0	10	9	1	12	2	0	0	0	0	5	32	157
Percentage of failures basement treatment	0	30.4	32.1	1.8	36.4	6.45	0	0	0	0	15.7	18.2	
Available for test October 1917	73	42	38	57	41	57	20	57	15	89	39	27	602
Withdrawn from test	2	3	0	1	1	4	2	2	0	15	4	36	
Continued in yard treatment Oct 1917	71	39	38	56	40	53	18	55	15	89	35	17	448
Failed after 250 days yard treatment Dec 1918	3	7	7	0	9	3	9	2	3	1	0	5	49
Percentage of failure yard treatment	4.23	18.2	18.4	0	21.9	5.0	16.7	3.6	2.1	1.1	0	29.4	
Continued in basement treatment Oct 1917	23	19	19	57	31	29	11	11	12	0	24	118	
Failed after 250 days basement treatment	1	1	0	2	2	2	0	0	0	0	0	1	6
Percentage of failure basement treatment	4.35	5.3	0	3.5	6.5	7.0	0	0	0	0	0	0.85	
Insulators starting yard treatment	74	77	79	57	84	69	57	15	92	47	44	91	807
Total withdrawals	2	3	1	1	1	5	2	2	0	15	4	36	40
Insulators to figure in percentages	72	74	78	56	83	64	55	13	92	76	65	76	767
Total failures	4	43	47	0	54	16	10	2	3	4	25	48	256
Percent of failure	5.6	58.2	60.3	0	65.1	25.0	15.6	3.6	3.3	4.4	38.9	62.5	

Average duration of yard treatment was 1060 days  
 \* Groups marked with a star had half their number in the basement for an average of 865 days  
 \*\* These insulators failed under repeated tests, at very short intervals

Series	A	B	C	D	E	F	G	H	I	J	K	L	Total
Figure Number	1	1	2	2	2	1	6	6	7	3	4	5	1

The accompanying tabulation of suspension insulator tests, compiled by the department of electrical engineering at Stanford University under the direction of Professor Harris J. Ryan, constitutes a valuable collection of data on the causes of failure of insulators under varying conditions.



the price paid for insulators ordered by the California companies during 1919, and it is well to bear in mind that these same companies have their lines insulated with units that are depreciating at an average rate of from 3% to 5% or higher per annum. The insulator manufacturing companies have some improvement to offer each year and in the past, time was the only way of finding out whether these so-called improvements were effective or not. The Insulator Committee feels that we should be able to test these matters and find out, if possible, the effectiveness of improvements, and the temperature cycle test seems to be one method of finding out the ability of new units to withstand thermal fatigue.

### Methods of Testing

The relative merits of various methods of testing, have been under discussion from time to time, so Professor Ryan in running through the last series of tests, very carefully tried out the effectiveness of the Megger, the Buzz-stick and the Spark-stick.

Unit	Megger Test	Buzz Stick Test	Spark Stick Test	60~ High Voltage to puncture before failure	Unit	Megger Test	Buzz Stick Test	Spark Stick Test	60~ High Voltage to puncture before failure
1	OK	OK		70	10	OK	OK	OK	3
2	OK	OK		5	19	OK	OK	OK	10
3	OK	OK		50	20	Faulty	Faulty	Faulty	0
4	OK	OK		50	21	OK	OK	OK	60
5	OK	OK		10	22	OK	OK	OK	2
6	OK	OK		0.1	23	OK	OK	OK	60
7	OK	OK		65	24	Faulty	Faulty	Faulty	0
8	OK	OK		0	25	OK	OK	OK	3
9	OK	OK		70	26	Faulty	Faulty	Faulty	60
10	OK	OK		35	27	OK	OK	OK	65
11	Faulty	Faulty		30	28	OK	OK	OK	3
12	OK	OK		7	29	Faulty	Faulty	Faulty	50
13	Faulty	Faulty		28	30	OK	OK	OK	60
14	Faulty	Faulty		50	31	Faulty	Faulty	Faulty	60
15	Faulty	Faulty		50	32	Faulty	Faulty	Faulty	60
16	OK	OK		1	33	OK	OK	OK	6
17	OK	OK		2	34	OK	OK	OK	55

566 Insulators tested  
55 Faulty insulators detected  
135 Insulators tested with 60 cycle high voltage only  
77 Insulators tested with 60 cycle high voltage, megger and buzz stick  
304 Insulators tested with 60~ high voltage, megger, buzz stick and spark stick

The above tabulation, based upon tests made of 566 insulators, is a comparison of the various methods of detecting faulty insulator units. This shows the 60-cycle flashover test to be most effective, eliminating many units which passed the other tests.

The Megger corresponded to an instrument having a 5,000 megohm scale and a 1,000 volt generator. The Buzz-stick was simply a small metal prong with treated wood handle, the metal part being used to short out the unit under test, the voltage duty of the unit being observed by the intensity and nature of the arc. The Spark-stick was developed by Professor Ryan and consists of a test fork like that used for Megger work, with a small high voltage condenser and adjustable spark gap mounted in series between the two prongs. The spark gap is incased in a small box, out of which is led a small insulating tube which is terminated in a suitable head-set near the end of the stick, which is attached to the fork. An insulated operating lever is also terminated near the lower end of the spark stick which connects to, and operates, the adjustable gap, a proper scale being provided which will designate the setting.

To operate the spark stick, the prongs are placed across the unit under test, the head-set placed over the ear, and the spark gap adjusted through the insulated rod until the maximum gap setting that the voltage will jump is obtained. From this a person can judge the condition of the insulator under test.

These three methods, together with the sixty-cycle flashover test were used, and of the first three methods, namely, the Megger, the Buzz-stick and the Spark-stick, there seems to be very little choice as regards effectiveness. The sixty cycle flash-over test, however, is much more effective, finding, as shown by the attached table, many units that will fail, although the other methods show them to be good.

### Partially Defective Units

Here is a point that some engineers have overlooked. If the Megger, or similar devices, pass a unit that on voltage test would puncture at 50,000 to 60,000 volts, most people seem to think the Megger has failed to pick out the defective units that give trouble and, therefore, it is not satisfactory for test work. However, from experience on several transmission systems and close observation of the behavior of various units, it is found that most any unit that the Megger will pass is doing useful work in the transmission line, and that on lines where three or more suspension units are used in series, the company can afford to leave such insulators on the line until the Megger, or similar device, will locate same, due to further deterioration. It is not intended to recommend that old insulators, which are to be reinstalled should be given voltage tests and all the possible defective units removed, but for nearly all of California conditions, the Megger results can be relied upon for maintenance work in transmission lines, as the partially defective units which it will pass are doing useful work and can be left in service until some later test will locate same without impairing service.

Before closing this Progress Report, the Insulator Sub-committee wishes to express its appreciation to Professor Harris J. Ryan of Stanford University who has directed and performed all the work and made possible our progress to date.

"The series by S. M. Kennedy on practical idealism in public service will be resumed in the next issue, the concluding article of the series appearing in the issue of May 15th.

The final article of Dr. A. C. Crehore's series on The New Physics will also appear in the May 15th issue.

Such widespread interest has been shown in both the Crehore and the Kennedy series that it is planned to issue both in book form at an early date.



# Power Factor and Rates

BY E. A. QUINN

(The most efficient possible distribution of power involves a consideration of the power factor of the consumer's equipment. It is suggested in the following paper that corrective apparatus should be installed in connection with such equipment and rates adjusted in such a way as to compensate the power company for the extra expense entailed. The author is general superintendent of San Joaquin Light & Power Corporation. The paper is one of those presented to the Pacific Coast N. E. L. A. Convention.—The Editor.)

The power companies of the Pacific Coast have in the past paid very little attention to the matter of power factor or power factor correction. It is true that upon occasions it has been urged upon the users of large motors to install synchronous motors or wound rotor motors in preference to the squirrel cage type, but beyond these sporadic attempts practically nothing has been done.

A low power factor of the consumer's equipment affects the following:

Distribution transformers, distribution lines, substation transformers and equipment, transmission lines and power house equipment. The poorer the power factor the more will these items be affected, and a lowering of the wattless current decreases their necessary size or capacity and thereby decreases the necessary investment. Unless the consumer is interested in power factor there is no reason why he should give the matter a thought. One way to interest him is to touch his pocket book, when power factor immediately becomes a live issue.

Unfortunately, no meter has been developed which accurately registers kva. Watthour meters, either integrating or indicating, may be used to accomplish this, but the result obtained is comparative only, and would require to make clear to a layman elaborate explanations of kw., kva., and reactive kva.

## Increased Costs Involved

It is not the purpose of these notes to map out a schedule of rates for taking care of power factor conditions. Rather, it is an attempt to call attention to the fact that a large investment is being made by the companies to take care of low power factor conditions which could be corrected if an effort were made in that direction, and that so far no metering equipment has been brought out which is simple, reliable, and can be installed at a low cost.

As an illustration of increased investment due to low power factor, the following will be of interest:

TABLE OF RELATIVE COSTS

P.F.	Lbs. Copper Required	Cost of Copper	Increase, due to Low Power Factor
100%	125,000	\$31,500.00	
90%	158,800	39,700.00	\$ 8,200.00
80%	200,400	50,100.00	18,600.00
70%	252,400	63,100.00	31,600.00

(From W. E. & M. Co. publication)

Or as an example, a substation having 1500 kva. installed in transformer capacity has this capacity almost doubled as the power factor reaches 50%.

As the power factor becomes lower the capacity of the transmission lines also becomes less, and this is finally reflected into the generating equipment, and last to the prime movers, as power is required to overcome the drop in the lines, etc., due to the heating effect of the wattless current.

## Remedial Measures

The means which can be adopted to improve power factor are as follows:

### On the Part of the Consumer:

Induction motors of proper capacity to carry the load.  
Wound rotor motors.  
Synchronous motors.

### On the Part of the Company:

Static condensers.  
Rotary condensers.

In many cases wound rotor motors can be used. Costing a little more than the squirrel cage type, they have better characteristics than this second type.

Self-starting synchronous motors are an advantage. In many cases if proper representations are made the consumer will install a larger synchronous motor, which could be used for power factor correction purposes, and which could be operated at leading power factor if necessary. In fact, this equipment could be made automatic to such an extent that as conditions varied the field excitation would vary. Considerable condenser effect could be obtained if more synchronous motors were used and received intelligent handling on the part of the consumer.

Induction motors should be of the proper size to handle the load. Too often we see a motor 30% or 50% loaded, with consequent poor power factor.

The static condenser at first glance seems to be the ideal corrective. It requires no attendant, has no revolving parts, and can be installed where it will do the most good, viz.: on the consumer's premises. However, the first cost is high, and it has not been developed for circuits of over 6600 volts.

The rotary condenser is the ideal power factor corrective when it can be applied to centers of distribution, or at substations. This equipment can be made automatic in all features, even to the starting thereof, and requires no attention other than an occasional visit from an attendant.

## Adjustment of Rates

In the making of a proper rate for power factor, it should first be determined if the present existent rates are fair for a certain power factor, and then an increase in rate should be allowed for a lower power factor.

The following is the form of agreement in use by an Eastern power company:

### One Minute Demand Contract:

"The purchaser shall at all times take and use three phase power in such manner that the power factor will be as near one hundred per cent (100%) as possible, but whenever at any time the current is not taken at one hundred per cent (100%) power factor and the power factor is less than ninety per cent (90%), then the basis of charge for that day, in lieu of the highest one-minute demand, shall, if the Power Company so elects, be considered as ninety per cent (90%) of the maximum kilo-volt-amperes taken for a period of one minute, divided by 0.746. This amount shall never be consid-



ered as less than the firm horsepower agreed to be purchased and paid for.

#### Fifteen Minute Demand Contract:

"The fifteen (15) minute integrated demand is determined by four (4) times the kilowatt-hours taken during a period of fifteen (15) consecutive minutes, or at the option of the Power Company in case the power factor is less than ninety per cent (90%) may be taken as ninety per cent (90%) of the calculated kva. taken during a period of fifteen (15) consecutive minutes multiplied by four (4)."

The above may apply to a large consumer, but how about calculating the kva. of a thousand small consumers? Metering equipment must be installed which can be easily read, or be understood by the purchaser. The difficulty of metering is the one stumbling block.

It is reasonable to assume that power companies should be compensated for the extra expense they are put to owing to power factor, but due to the metering difficulties, what rate can be adopted as a basis for an equitable charge? It would be impossible to measure periodically the power factor on all consumer's premises. The expense involved would be too great, and the results would be too uncertain. I am speaking now of the small consumer.

#### A Practical Solution

To my mind, the solution of the question is the installation of automatic rotary condensers at suitable locations and the adoption of a rate per kw-hr. which would include the cost of interest, depreciation, maintenance, etc., of the corrective apparatus.

The following is a comment from an Eastern company on the meter situation:

"In a number of cases this company has inserted a power factor clause with the intention of enforcing it, but due to the difficulty and expense involved in connection therewith we have allowed matters to run along without definite action."

"In this connection, do you think any penalization for low power factor can be carried out until there is some cheap and reliable instrument device which will show the maximum kilovolt amperes and kilowatts in proper time relation? The important matter to us being to determine the power factor conditions which affect our peak load and also the transformer installations provided for the customer. Such instruments have been devised specially by some of the large companies, but I do not know of any commercial instrument which will fill the bill and which is within the limits of costs required by moderate sized installations."

There are curve-drawing power factor meters on the market. All of you who have used a graphic meter to measure consumption on the consumer's premises will understand how unsatisfactory such an instrument is. The cost is prohibitive in the case of small consumers.

From the above it would appear that in the case of large consumers a recording instrument could be installed so that power factor conditions on the consumer's load would be known, and then in the case of small consumers an attempt could be made to regulate the kind and size of motors, and that corrective devices could be installed at the power companies' expense and the rate be such that a return upon the required investment would be received.

## Electricity in the Development of Oil Lands

BY R. A. BALZARI, O. A. KOMMERS AND F. V. BOLLER

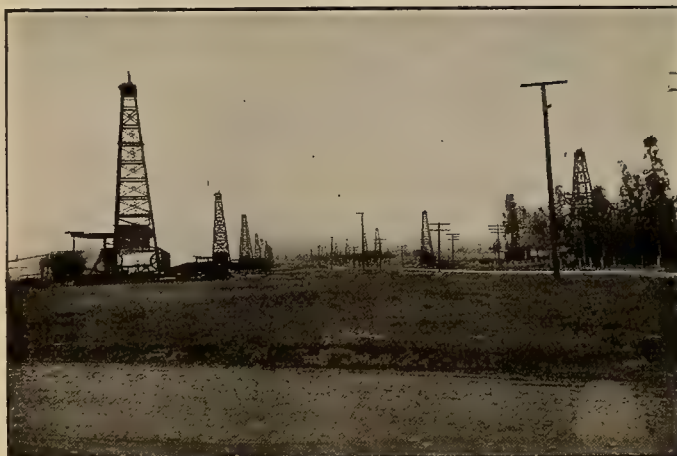
(The cheapness and accessibility of fuel for the generation of power depends mainly upon methods of handling. In the following paper presented to the Pacific Coast Section N. E. L. A. Convention, it is pointed out that the rapid development of the rich oil lands of the West can be accomplished not only more effectively, but more cheaply by the use of electrical equipment. Of the authors, the first is with the Westinghouse Electric and Manufacturing Company, and the other two with the San Joaquin Light & Power Corporation.—The Editor.)

The importance of the oil industry to the development of our State has been brought very forcibly to the attention of the electrical interests during the preceeding five years. The marked increase in the consumption of electrical energy in all branches of the industry, the fact that the hydroelectric generating plants of the power companies have not been able to run to full capacity due to a scarcity of water, and also that further development of hydroelectric plants was prevented by war measures, these conditions caused the hydroelectric companies to be forced to carry a large percentage of their load on their standby steam stations.

This demand for power caused an active interest in the supply of fuel oil. It was found upon investigation that the reserve supply of oil was diminishing at the rate of about 1,500,000 bbl. per annum and that the reserves would all be exhausted in a few years unless prompt measures were taken at once to increase the production and also conserve the present supply. The price of fuel oil has been steadily advancing so that the oil producer who in

1914 did not feel that he could develop his lands now put forth every effort to make his property produce to the limit.

These different conditions have made the intro-



Oil well avenue at Coalinga, California. There are at present 9127 producing oil wells in the state and approximately 100,000 acres of land which is considered oil land but which has not been proven to date.

GEORGE CAMPBELL says: "The Campbells are coming—to convention, that is."



duction of electric motors into the oil fields easier than it was prior to 1914.

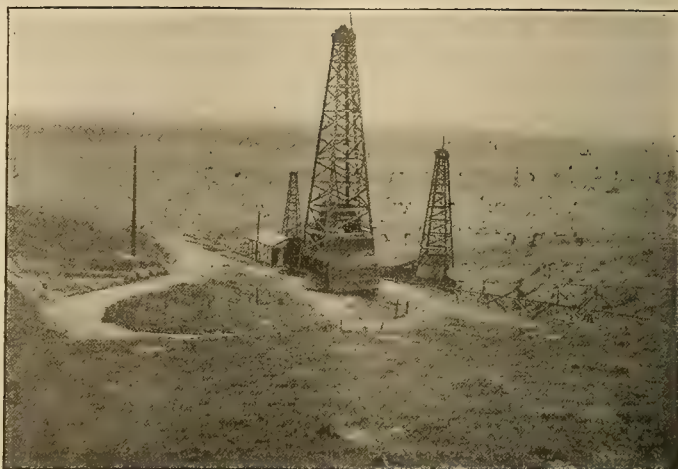
The oil producer in trying to increase his volume is now willing to consider any method either in drilling, or pumping that will insure him a greater production of oil at a lower cost. The people interested in the production of oil, like most people who obtain their livelihood from the earth are prone to follow the customs of the past, and it has taken ten years of constant effort by the central stations and manufacturers together with the existing conditions to get them to do the obvious thing, electrify their wells.

#### Comparison of Motive Power

In order that we may consider the relative merits of electricity with the other motive powers that have been used in the oil fields, let us compare in percentage cost the relation of the electrical installation to the steam and gas installation and also the relation of the operation and maintenance of an electrically operated plant to that of steam and gas. In making the comparison, we are only considering that portion of the oil well equipment which would be eliminated by the use of electric motors.

In the steam engine driven plant, which has been the most commonly used, the cost to the oil producer per well installed, averages one and a half times as much as that of an electric plant. This does not take into consideration the cost of water. The cost of water in Central California is a very important item, as at several points water is not available at all and it is necessary to pipe it from some distant point. In such cases the water cost is very high. In other localities they are able to obtain their own well supply. Wells in these districts cost from \$3,000 to \$10,000 each. The number of oil wells served by the boiler plant does not alter the

ported cost of operation of \$2.00 per day per well. This runs as high on other leases as \$10.00 per day per well. This wide variation is explained by several factors. The variation in water costs, and the fact that the low cost per day occurs where the most economical character of steam installation is made and one boiler plant is supplying a large number of wells. As a usual thing the steam lines are uneconomical, the heat losses during cold weather are great, as these steam lines are not well lagged. The steam



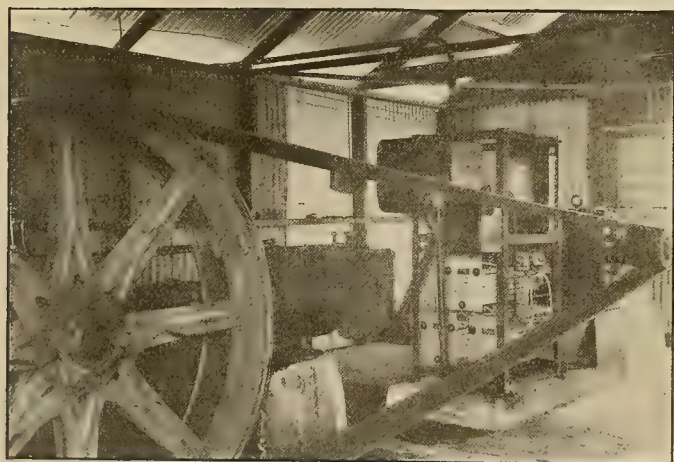
Electrified well of the Shell Oil Company at Coalinga, California. The gas engine driven installation costs the producer 1.6 times the cost of the electrical installation.

engines are non-condensing, and a very low operating efficiency.

The labor cost of a steam driven installation is materially higher than for an electrically driven plant. This is caused by the necessity for close attention to the boilers and engines. If for any cause steam pressure drops, the pumper must be available to adjust the engine speed so that the well is pumped at the most efficient speed.

The gas engine user commonly does not know his costs of operation and maintenance. If you ask him what his fuel costs are, he will tell you that his gas does not cost him anything, therefore, he does not have any fuel charges. It might be possible for him, however, to collect his gas and sell it in the field at a fair return. He does not keep a separate record of his engine maintenance charges, although it is necessary for him to maintain a well equipped machine shop and a corps of high-grade mechanics in order to keep his gas engines operating. We have interviewed a large number of operators of gas engines and have been unable to get a definite statement as to costs from any of the organizations. They have no absolute records, so do not wish to make statements. The Field Superintendent, however, of one of the larger companies who had in a personal way kept account of gas engine operation, assured me that the cost of operation of their engines was at least \$2.00 per day per well.

The cost of operating a well by electricity is largely a question of power. The maintenance charges on a motor installation are very low, amounting to only a few dollars per year. We have records showing wells that are pumped and maintained at an average cost of 50 cents per day (individual



15-30 horsepower motor, control and counter shaft on the Nevada Petroleum Company's lease at Coalinga.

water well cost. The water obtained is of very poor quality being quite heavy in alkaline salts.

The gas engine driven installation costs the producer 1.6 times the cost of the electrical installation. This is on the assumption that the producer does not have excessive length of pipe to run to his wells for furnishing the necessary gas to operate the engine.

The cost of operating a steam driven well varies over a very wide range. We have a minimum re-



motor drive). Where the wells are pumped from jack plant the cost runs as low as 12 cents per day. The Coalinga Mohawk Oil Company at Coalinga, whose wells range from 4000 to 4800 feet in depth, pump for an average of \$1.80 per day. These give pumping costs over the wide range of wells, that is from the shallow well at 50 cents per day to the deep well at \$1.80 per day. We have prepared a fair exhibit which gives in tabulated form cost data on the electrically operated well that we feel can be taken as an average for the entire oil fields.

There is one point that I wish to call to your attention however, and that is the maintenance charges against the electric motor. The largest percentage of maintenance charges on these reports, is repairing of counter shafts which are not made by the manufacturers of electrical equipment, but which due to the fact that they are necessary in a motor driven installation have been charged against the motor maintenance cost. There is being designed at the present time a counter shaft to eliminate all the troubles that have been experienced in the past and which will remove practically entirely the charges now assessed against the electrical installation.

### Oil Production

Oil producing companies that were formerly operating on a steam drive and are now operating by electric drive claim a greater production by electric than by steam drive. This is evident when you consider the two methods of operating the well. In the steam driven unit the steam pressure at the well will vary according to the temperature of the atmosphere inasmuch as the steam lines from the boiler to the wells are never sufficiently lagged to insure uniform temperature of the line. In addition to this the accumulation of water in the steam line causes at times a drop in pressure and in each case a drop in pressure means a slowing down of the engine which in itself causes a reduction in produc-

tion. The attendant when he makes his periodical rounds adjusts the speed of the equipment, but in the meantime the well has lost in production due to the lower speed at which it was operated.

This is not the case however, with an electrically driven pump, inasmuch as the motor always operates at the predetermined speed until changed by an attendant. This insures a uniform production.

The gas engine, due to engine troubles, has not the reliability of the motor. One operator who has replaced his gas engine by motors, claims that his production increased at least 20 per cent due to the uniformity of drive.

The oil companies utilizing electric motors say that they would under no consideration return to the older methods of drive. They prefer the motor for its reliability in service and the ease with which it can be handled.

### Drilling by Electricity

For many years the oil well drillers would not try the motor for drilling purposes. This, as was the case in pumping, was due to their inherent desire to follow custom. Finally, however, a well was successfully drilled by standard tools with an electric motor and now there are over 20 drilling rigs running by the use of electricity.

The electrical installation for drilling can be put in at less than one half of the cost for a steam installation, not taking into consideration the additional cost of water. The average cost of power for five electrically operated drilling outfits in the Midway fields over a period of one year is \$90.00 per month per equipment. A steam installation could not be operated in the same field as the electricians are working for a cost less than \$300.00 per month. Just as good drilling time is made with the motor as with steam. The drillers after once becoming accustomed to the motor drive would not go back to the use of steam power.

### COST OF ELECTRIC POWER

Southern Pacific—Coalinga Field. June to November, 1919, Inclusive

Wells—7, 11, 12, 14, 16, 18, 20, 55, 57, 112, 114, 119, 120, 121 Section 19-C  
 " 2, 3, 7, 8 " 31-A  
 " 38, 40, 339 " 33-A  
 " 48, 49, 50 " 11-A  
 Nos. 57-112-114-119-120-121 wells on only part of above period.

Month:	June	July	August	Sept.	Oct.	Nov.
Total Production, bbl. ....	11233	8744	13298	12996	20443	17999
Total Number Wells .....	17	17	20	20	24	23
No. Wells Individual Drive.....	13	13	16	16	17	17
No. Wells on Jack.....	4	4	4	4	7	6
Total kw-hr. used .....	34945	34434	47653	46201	51081	67797
Total Cost of Power .....	\$379.53	\$375.10	\$505.66	\$504.88	\$544.43	\$730.52
Total Cost of Labor (inspection, repairs, etc.).....			144.10	68.78	239.79	130.84
Total Cost of Repair Parts (motors and counter shafts).....			78.10	58.90	75.32	14.38
Average Cost per kw-hr. ....	.01084	.01089	.01061	.01092	.01065	.01077
Average kw-hr. used per bbl. ....	3.11	3.93	3.58	3.555	2.498	3.7689
Average hrs. pumped per well per day.....	20.25	20	19	20.4	19.8	17
Average Cost per bbl. for Power.....	.0337	.0427	.03802	.03885	.02663	.04057
Average Cost per well per day for Power.....	.7423	.7521	.8155	.8145	.8249	1.025
" " " " " " Labor .....			.240	.114	.322	.18
" " " " " " Repair Parts .....			.126	.0981	.101	.022
" " " " " " Power and Labor .....			1.115	1.02	1.30	1.23
" " " " " " bbl. for Labor, Repairs and Power.....			.0547	.0485	.04204	.0486
" Gravity of oil .....	16.8	16.8	15.8	15.8	15.8	15.8
Average depth; exclusive of the 4 wells on a Jack plant from which oil is pumped .....	2200	2200	2200	2200	2200	2200
Line Pressure Average .....	200	200	200	200	200	200

Total power used, includes power consumed in pumping, pulling, rods and tubing and bailing.

Labor includes regular inspection, oiling and repairing, motor counter shaft, and belt from motor to counter shaft. Does not include labor of pumpers and pulling gang.

Repairs includes motor, counter shaft and belt repairs.

LEE H. NEWBERT says: "Convention is a whole cooperative campaign in itself"







### Summary

A summary will show what we feel to be the relation of the electrical industry to the development of the oil lands in the State of California.

Electricity for the pumping, maintaining and drilling of oil wells is a great advantage to the oil producer. It costs him less to operate the well after installation is made. It produces more oil and is easier to handle inasmuch as it eliminates the many aggravating troubles which exist in other kinds of drive.

The load is a good one from the standpoint of the power company inasmuch as it has a very high load factor, pays them a fair return on their investment and when once connected is assured for a great many years.

The manufacturers of electrical equipment obtain for each oil well installation at least \$1800.00 in equipment.

The electrical contractor can work with the producer in making his electrical installation, and also in doing his maintenance and inspecting work.

It is for the best interest of the electrical industry that the oil lands of our State be developed to the greatest extent. Therefore it is the recommendation of this committee that the Pacific Coast Section of the National Electric Light Association try to assist the oil producer in his land development and also use if possible the influence of the national organization in hastening the passage of the much needed Oil Land Leasing Bill.

## Some Important Features of Construction Accounting

BY C. P. STAAL

(The amount of capital invested in the properties of large public utility companies makes the most scientific accounting necessary to any sort of permanent progress. The chief accountant of the Southern California Edison Company explains the outstanding features of public utility accounting in this paper for the Pacific Coast Section, N. E. L. A. Convention.—The Editor.)

For the purpose of making the efforts and activities of the accounting branch of the electrical business of the greatest possible value to the men who direct the policies and finances of the industry and upon whose shoulders the final burden of responsibility rests, the Accounting Section of the National Electric Light Association is devoting its energies toward working out the most scientific methods of compiling figures and keeping records. One subject, which appears to be of paramount importance, is an accurate accounting of capital invested in the properties of the utility, the principal reason being, that the amount shown as investment in properties operated by the utilities forms the basis for determination of the revenues to which the company is entitled as a return for its services.

Considering the large sums which have been expended in the past as fees, salaries or retainers for valuation engineers, in an effort to verify the amounts carried on the books as cost of invested capital, it would appear that we can well afford to direct our very careful energies toward improving the methods of compiling the figures and handling expenditures in the records. There should be no doubt as to their correctness and as to their representing actual funds legitimately expended for construction or acquisition of properties required to carry on the business successfully. One of the best known methods of substantiating cost figures, as shown on the books of a utility, is by comparison with other companies whose properties are similar or have been constructed under similar conditions.

While most of the states have their prescribed classification of accounts provided by their utilities commissions, and while their requirements are very nearly the same as to primary accounts, there appears to be such a variation of method in use by dif-

ferent companies for compiling the details of construction costs, that the value of the final results, for comparative purposes at least, would seem to be somewhat doubtful.

### Uniform Rates

Although under the present policy of the utilities commissions the question of competition is generally eliminated, it is undoubtedly the purpose and aim of the rate fixing body to approach, as nearly as possible, a condition of uniformity in rates throughout the territory over which they have jurisdiction. Inasmuch as rates are, generally speaking, based upon invested capital, usually determined by book costs, the importance of employing correct methods in arriving at book costs is at once apparent. All of the larger companies and such small companies as are experiencing anything like "a present day" normal growth of business, will find it necessary to maintain a permanent organization of executives, engineers, accountants and others, to properly handle the business, a very considerable portion of which is new construction. Presumably most of them are charging to their fixed capital accounts some portion of the cost of carrying on such an organization, but so far as the writer has been able to inform himself there has been no fixed or uniform rule laid down by the utilities commissions, neither have we seen any effort on the part of the companies to establish between themselves anything approaching uniformity in arriving at a reasonable and fair charge to capital on account of expenses incurred in connection with the administration, general engineering and accounting. If a careful analysis were made of the amounts so charged in different companies, we would probably find as many different theories and methods as there are companies, the variation in some instances being based on the varying theories of accountants and



engineers, and in others upon the financial condition of the utility. Under such conditions it can hardly be expected that the figures reported as cost of fixed capital by the several utilities reflect with any degree of uniform accuracy the moneys actually expended.

#### Possibility of Wide Range of Variation

Down to the present point we have dealt only with the possibility of a wide difference in the determination of the amount charged to capital. In addition to this we have a possibility of wide range of variation, in placing the amount determined as a proper charge to capital, in our classification of accounts. I will endeavor to show that the particular position, in our classification of accounts for fixed capital, in which an expenditure is placed, is of very great importance, as there are certain accounts which are not given the same relative value as others in the final consideration from which rates are established. This variation applies not only to that part of the expense of the general organization which is segregated as a proper charge to capital, but also to the salaries and expenses of construction engineers, superintendents, accountants, timekeepers and any others, whose time is wholly devoted to a large construction job, and therefore chargeable in total to capital account. We have in our prescribed accounts certain accounts designated as "Undistributed Construction Expenditures." In the California Classification of Accounts they are designated as "C-31" with subdivisions "A" to "E." Those with which we are particularly concerned, however, are "A—Engineering and Superintendence" and "E—Miscellaneous Construction Expenditures."

The text of these accounts deals only in a general way with the handling of charges, the interpretation of their real purpose and practical application being largely a question of judgment on the part of the accountant. For instance, under subdivision "A—Engineering and Superintendence," the text of the California Classification of Accounts reads, "Charge to this account all expenses for services of engineers, draftsmen, and superintendents, employed on preliminary and construction work and all expenses incidental to the work, **when such disbursements cannot be assigned to specific construction.**" The number of employes, from the chief or general engineer in a large utility down to the lowest paid draftsman or chainman, represents, in terms of payroll, a very large expenditure, and the question of determining the point in the distribution of such a payroll at which it cannot "be assigned to a specific construction" job, is subject to a very wide range of variation, consequently in one case we may have a very large percentage of the amount of such payroll charged direct to the specific primary accounts, whereas in another case the larger percentage of the payroll may be charged to the account of "C-31-A," "Undistributed Construction Expenditures."

#### Construction Expenditures

While the text under Subdivision "E," "Miscellaneous Construction Expenditures," is not identical with that which refers to engineering and superin-

tendence, the context is practically the same and, undoubtedly, it is subject to the same variations in interpretation and practical application, and no doubt the amount involved on the payroll, from the chief executive down to the lowest paid clerk or timekeeper, probably compares favorably with, or even exceeds, the amount of the engineering payroll. It is sufficient to say that these two items form a very considerable portion of the expenditures on any large construction job, and that the method of distribution and placing in the fixed capital accounts is subject to a wide degree of variation. These variations without a doubt produce a considerable difference in the accounts representing the details of construction casts in different utilities. More important than this, however, is the fact that in considering the investment cast as shown by the books, these accounts known as "Undistributed Construction Expenditures" do not seem to be generally accepted at their face value. There seems to be a tendency toward considering them as representing value of a more or less intangible nature and in some cases, I believe, they have been wholly disregarded in determining the base value for establishing rates.

I have personally inspected statements of construction jobs ranging in amount from three-quarters of a million to eighteen millions where the amounts charged on the books for engineering and administration ranged from 10½ per cent to 13 3/10 per cent of the total construction expenditures, which indicates that the amount involved is worthy of very serious consideration, that it may be placed in the records so that it will represent full value and that it may be so handled by the various utilities that a proper comparison of costs may be obtained.

#### Benefit of the N. E. L. A.

The great benefit which is to be derived from an association such as the National Electric Light Association is unity. Unity of purpose, unity of policy, unity of methods employed, finally leading to a uniform degree of success to the electrical industry which otherwise would be impossible. Under such conditions the activities of the member companies follow so closely along similar lines that it would be comparatively simple to standardize their practice in almost any branch of the business.

If this subject were given the careful consideration of engineers and accountants working in conjunction, it would seem that a schedule to cover construction accounting, agreeable and convenient for all, could easily be worked out.

It is also recommended for consideration of our executives and financiers that the utilities commissions of the various states be approached on the subject of obtaining a revision in the prescribed accounts to permit of distributing to direct primary accounts those items which, under present requirements, are carried as "Undistributed Construction Expenditures," for the reason that, when stated as undistributed construction expenditures, there is a tendency to doubt their worth in the final determination of base values in connection with fixing of rates.



The usual objection that the commission is not able properly to check and control the amounts charged to capital accounts unless they are carried in special accounts, as provided under "Undistributed Construction Expenditures," can be met with a provision for carrying such charges through these accounts on a predetermined equitable basis.

This is merely a question of keeping records, while the reason for asking permission to change the present arrangement is one of great importance to the utilities, affecting as it does the statement of basic values of the properties.

### Compilation of Perpetual Inventory

Another subject which we believe should be given careful attention of engineers and accountants is the compilation of a perpetual inventory or valuation of properties. In most of the larger utilities something is being done along the line of keeping a perpetual inventory of physical properties without, however, attaching costs or book values to the items of physical property as they are shown in maps and drawings. This work of compiling a physical inventory we find is in most cases being carried on independent of the figures which are carried in the company's books and in the opinion of the writer, therefore, loses the major portion of its value as compared with the results which we believe could be obtained if this work were carried on in such close relationship with the keeping of records in the accounting department that the values which are put into these records, representing additions to property, could also be worked into the physical inventory records, thereby producing a perpetual valuation fully substantiated by facts and figures. Large sums frequently are paid at a later date for the services of the valuation engineer, whose work, on account of the time elapsed since the additions were made, must necessarily be fraught with difficulties and uncertainties and considerably prolonged, unless the very best of records are available.

### Indirect Costs

In the construction of large plants or units of the utility there are necessarily large sums of money expended for which, after the plant has been put in operation, there is no tangible evidence in the shape of buildings, equipment or other operating facilities. These are the items which are generally referred to as "indirect costs." When the valuation engineer arrives on the scene it is very doubtful if he is able to draw upon his imagination sufficiently to properly reproduce in his cost data items such as these, and it is almost certain that in cases where such expenditures are thrown into the accounts known as "Undistributed Construction Expenditures" they will lose their identity, so far as the engineer is concerned, who makes the valuation probably years afterwards. The result is they are not included in the totals which are finally compiled and upon which the earning power of the utility is established.

We do not believe that any of us, whether we be accountants or engineers, are willing to admit

that we are incapable of keeping records at the time the construction work is being done which accurately reflect the moneys expended for construction. At any rate it seems logical to suppose that we should be better able to show, at the time the work is being done, a correct and accurate record of costs than could possibly be reproduced a number of years later, or at a time when a valuation is made.

### Suggestion

Assuming that the above statements and conclusions are approximately correct, we believe we are justified in offering as a suggestion that a very considerable amount might be saved to the utility if proper advantage were taken of these conditions and the work of keeping records and compiling physical property data could be so harmonized that a perpetual valuation of property would be the result. Aside from the saving which would be accomplished, a record such as this would be very valuable in many different ways.

The writer believes these subjects are of such importance to all of us as to deserve our very careful consideration.

### CLEANING OF BLAST FURNACE GASES ELECTRICALLY

A paper describing the installation of a new type of blast furnace gas cleaner and the results obtained with it at the furnace of the American Manganese Manufacturing Company at Dunbar, Pa., was printed in the December issue of the Journal of the Engineers' Club of Philadelphia. The paper was written by N. H. Gellert and K. V. Laird of the Gellert Engineering Company. Mr. Laird is a Western man and a graduate of the University of California in 1914.

The cleaner installed at Dunbar is the first of its kind in existence and is an adaption of the Cottrell electrical precipitation process to the blast furnace. This process, while new to the blast furnace, has been in extensive use throughout the country in the cement industry as well as in various metallurgical processes. The cleaning of blast furnace gases is a vital factor in obtaining plant efficiency, owing to the effect of dust on stoves and boilers and the lowering of the available heat in the gases. The operation of iron and ferro-alloy furnaces at maximum possible efficiency is now more imperative than ever before, owing to keen domestic competition as well as a rising foreign competition.

The trend of both foreign and domestic gas cleaning practice shows the foreign to be in the lead, and improvement of domestic practice is therefore imperative, as the iron industry is today facing the necessity for these economies here in the United States as that necessity was faced years ago in Europe, and the cleaning of gas on a more extensive scale is not the least of these economies.

In view of these facts it is evident that the fostering of the electrical clearing of blast furnace gases is of even more importance to the iron industry than to the electrical industry itself.



## Value of Appliance Solicitors

BY A. W. CHILDS

(An electrical appliance may be advertised nationally by the manufacturer and locally by the contractor-dealer, yet its sales will not be large unless the appliance salesman brings the device directly to the housewife's door. The story of how the power companies first made use of the appliance solicitor, and of how the dealer has profited through his work, is told here by the superintendent of sales with the Southern California Edison Company, together with a review of the vast opportunities for further increasing sales by this means. The paper is one of those prepared for the Convention of the Pacific Coast Section, N. E. L. A.—The Editor.)

Power companies, in studying the science of load building, have recognized the value of the household appliance load. It produces several essentials of a well developed electric property; viz., day demand for kilowatt-hours at maximum rates, being measured through lighting meters; improved load factor; greater diversity, and larger earnings from present investment, as in the majority of cases the installation of additional meter and transformer capacity is not required. Manufacturers, in considering the problems of production, have accorded a prominent place to small labor saving devices. Jobbers have found that the handling of small apparatus constitutes a considerable portion of their business. Electrical dealers, outgrowing their swaddling clothes, are being sustained and nourished by their appliance sales. Consumers are coming to recognize more and more that appliance solicitors are not pests to be avoided, but constitute that great army of occupation which will liberate the women of the world from menial tasks, through the uses of electricity.

### The First Electrical Household Appliance

Fifteen years ago the electric laundry iron was first produced, forerunner of the many appliances which we have today. The power companies accepted the responsibility of popularizing its use. How to introduce the iron into the homes, was a puzzle. Finally the persistent endeavors of a crew of house-to-house men saved the day. As a beginning, one power company loaned ten thousand irons to families, on one year's trial. Then and there the appliance solicitor became a fixed institution. The power companies recognized him as an asset. They allotted him a useful place as an educational agent in the introduction of appliances, and he became a prominent factor in scientific load building. The field was so thoroughly prepared that when the electric percolator was brought out, the same power company placed an initial order for five thousand and sold them so readily that the order was duplicated within a few months.

Other appliances followed the electric laundry iron and were sold in large volume upon the power companies' lines, by courteous and energetic solicitors.

### The Personal Element

Wherever the appliance solicitor went, he made converts to the "Home Electrical" idea. Inquiries came in increasing numbers to electrical contractors. Their interest was aroused and they put in small stocks. Store sales commenced, and the remarkable and constant increase that has since occurred is due

in no inconsiderable measure to the cumulative work of the appliance salesman, who has continued from that day to this to educate the public through affable and intelligent solicitation.

A considerable number of people need canvassing to close. They are receptive, but not sufficiently informed to buy on their own initiative, although they will do so when properly solicited.

The experience of the power companies, while building up the load, has impressed the necessity for continuous effort. A solicitor may canvass a street one day, yet the next day another solicitor could canvass the same street and make sales. There is apparently no point of saturation.

Uses for electricity are developing so rapidly that the introduction of new devices is continually necessary, and this makes it imperative to reach out to the consumer. Appliance salesmen and saleswomen can best carry the glad news, kindle the desire and hasten the conversion.

Appliance soliciting is a class of work for which women are peculiarly qualified. They are in sympathy with the housewife and have an inherent desire to lessen her burdens. The woman solicitor finds a welcome at the door, and an easy entry. Appliance sales women have not been tried out in California as yet to any considerable extent. Here is a splendid opportunity for them and there is no reason why they should not make good.

The manufacturer advertises the device nationally, the contractor-dealer advertises it locally, but it remains in a large degree for the appliance salesman to "make the buds of advertising blossom into sales."

Apparatus in use is not always satisfactory; some needs nursing along, cords require attention, consumers have questions to ask, and periodical calls are necessary.

### The Cooperative Campaign

Previous to the organization of the California Electrical Cooperative Campaign, there was a lack of coordination within our industry, each branch working independently. While getting fairly good results, the necessity for cooperation was realized, in order that a better understanding might be reached regarding the functions and responsibilities of each branch. Developments made it clear, as the campaign unfolded, that if the jobbers and contractor-dealers were to make the most of their opportunity, they must accept the corresponding responsibility and have an army of appliance solicitors in constant contact with the buying public, offering their wares at each door. This was the method the central stations used in promoting the appliance business and



it was the way they were continuing its development. In the opinion of many it was the best way.

If the time were to come, in individual instances or otherwise, when the contractor-dealer would succeed in merchandising appliances in immense quantities, he would require to do more than remodel his store, advertise and "wait for 'em to come in." He would need to be in a position to say: "Mr. Power Company, you are duplicating my efforts. There is no further necessity for you to continue house-to-house solicitation. I have competent, efficient and successful appliance solicitors canvassing your consumers at regular intervals and find that the oft-mentioned 'saturation point' is a myth. Call off your house-to-house men and let mine do all the work." Such a request would be sound and logical and the California Electrical Cooperative Campaign, recognizing this fact, included in its program the education of the contractor-dealer to the value of permanently employing appliance solicitors. The Campaign went further: it undertook to procure the solicitors and to secure for them the necessary preliminary training.

As a result, the Campaign has been instrumental, during the past year, in securing and placing with the contractor-dealers, a considerable number of appliance solicitors. These men, after spending a week with the jobbers to become familiar with the various lines and kinds of appliances, have canvassed methodically, on a commission basis, more than paying their way in sales, and as a by-product advertising the dealer, bringing his name and the nature of his business prominently before the community.

In December, 1918, the contractor-dealers of California were employing thirty appliance solicitors. December, 1919, found one hundred and seventy-six in the field. At this date there are over two hundred employed.

Some of these men are selling irons, toasters and similar apparatus requiring little time in closing; others are selling washing machines and vacuum cleaners which call for demonstrations.

#### **An Extensive Field**

Taking a conservative average of 300 calls a month by each solicitor, 60,000 families were interviewed last month. This is at the rate of 720,000 a year. Allowing four and one-half persons to a family, it will be seen that a number approximating the entire population of the state will be interviewed within the next fifteen months, provided the 200 solicitors are kept in permanent employment. Two sales a day would be a very conservative mark to set for each solicitor. If the 200 men were to sell 400 appliances a day, and worked 300 days a year, the result would be 120,000 appliance sales. Let us go further: Only eighty-seven dealers are employing solicitors. There are over 400 dealers in California. Allotting one solicitor to each of the remaining 313 dealers, there would be over 500 solicitors at work, capable of selling 1000 appliances a day! You may say the estimate is too high; that many small

dealers cannot afford to employ a solicitor. Room for argument there. It might be contended that no dealer can afford to be without one. "Large oaks from little acorns grow." Besides, some of those now without solicitors are not small dealers, but have good stores in prosperous communities. However, to be ultra-conservative, let us cut the estimate in two. Let us keep 250 solicitors everlastingly at it, selling 500 appliances a day—150,000 appliances a year. Do the figures appear large? Quite the contrary, when we consider that at that rate it would take over four years to place only one labor saving device with each family in California, accessible to electric service. The policy of the California Electrical Cooperative Campaign in urging the employment of appliance solicitors should be ratified by every live electrical dealer in the state. The need is apparent and the harvest is ripe.

When we consider that there are over 400 contractor-dealers in California and that at the present time only eighty-seven are using appliance solicitors, we wonder why the other 313 do not adopt this plan. If 250 men making the rounds at intervals of three months can sell 150,000 appliances, 800 men could cover the state four times a year and sell over 400,000 appliances. The manufacturer would not only increase his output of labor saving devices to that extent, but would be called upon for more wire, transformers and generating equipment; the jobber would materially increase his general sales; the contractor-dealer be called upon for adequate wiring and additional outlets; houses under construction would need more wiring than formerly; and the power company would be supplied with a most advantageous load.

#### **The Advertising Appropriation**

The California Electrical Cooperative Campaign estimates that the electrical dealer is warranted in expending a minimum of three per cent of his gross sales, for advertising. The estimate is based upon the experience of merchants who have analyzed the subject, and who are successful advertisers. This does not mean that the entire amount must be expended in printers' ink. Newspaper advertising is extremely important, and the Campaign has been active and successful in encouraging its use; but it is recognized that advertising of much value emanates from the work of the appliance solicitor. He awakens communities to a better understanding of the splendid service rendered by the electrical industry, and directs attention to the local dealer, who is a potent part. Should there be cases where the employment of appliance solicitors shows a temporary loss, the dealer could well afford to write off the difference to advertising.

#### **Service and Returns**

In these days, when so much stress is laid upon service, it is well to remember that personal contact with intelligent solicitors inspires confidence, carries the shopping district of the city into the home, where an attentive salesman, anxious to please, de-



votes his entire attention to the consumer, thus overcoming the indifference, lack of interest, and want of knowledge concerning the appliance itself, sometimes shown when the condition is reversed and the consumer visits the shopping district. Department and hardware stores have electrical appliances on display and advertise them consistently, but it remains for the electrical dealer to solicit trade from door to door. As long as this course is systematically pursued, the electrical dealer earns the advantage over such competition and the consumer will continue to "buy electrical goods from electrical dealers."

If the dealer omits this service, no matter how alert he may be in other respects, a portion of his business will gradually find its way to other stores.

D. E. Harris, vice-president and sales manager of the Pacific States Electric Company, has compiled the following very interesting data, obtained from seventeen California distributors, showing the increased number of household devices handled by them during 1919, as compared with the previous year. The table does not include information from all California distributors, nor all items handled by the eleven reporting. The results shown reflect the general condition obtaining among all electrical jobbers in this state. The larger number of appliance solicitors engaged during 1919 has a marked bearing upon the satisfactory results shown.

Let the contractor-dealers of California make a similar comparison individually. Do sales of irons show an increase of 48% Have toaster sales in-

creased 96%? Percolators 80%? Did sales double during 1919? If not, let each look for the reason.

Kind of Appliance	Quantity		Increase 1919 Over 1918
	1918	1919	
Air Heaters (600 watts or less).....	10,135	19,399	91%
" " (over 600 watts).....	861	2,000	132%
Chafing Dishes .....	193	377	95%
Curling Irons .....	2,971	4,820	62%
Disc Stoves (600 watts or less).....	1,260	1,979	57%
" " (over 600 watts) .....	397	587	48%
Fans .....	10,688	12,205	15%
Heating Pads .....	5,157	7,627	48%
Irons .....	43,870	60,517	38%
Ironers .....	148	368	150%
Immersion Heaters .....	929	1,665	79%
Percolators .....	4,832	8,717	80%
Radiant Stoves .....	5,651	10,073	78%
Toasters .....	5,803	11,372	96%
Vacuum Cleaners .....	4,228	9,977	136%
Vibrators .....	1,324	2,748	107%
Washing Machines .....	2,989	7,764	160%
Sewing Machines, Hair Dryers, etc.....	3,057	6,049	98%
Miscellaneous .....	5,002	8,612	72%
Ranges .....	276	647	134%
Water Heaters .....	210	412	96%

The contractor-dealer has undertaken the obligation of service, with all that it implies and carries with it. "Better service to the public," as well as more profit to the industry, lies in promoting the use of household electrical appliances.

Are the eighty-seven dealers satisfied with the direct and indirect results which their appliance solicitors are producing? If these results are satisfactory, then why have the other dealers been quiescent? Is their business large enough as it is; are they satisfied with the present amount of profits or do they want more business; and do they understand that the way to get more business is to put more appliance solicitors in the field?

## Standardization of Wiring Methods

BY H. H. COURTRIGHT

(The general trend towards standardization is seen in the formulation of safety rules and fire hazard rules in all sections of the country, and the consistent effort to unify these as far as possible. The special problems of wiring which affect the central station as well as the architect and builder are discussed from a standardization viewpoint in the following report of the Commercial Committee to the Pacific Coast N. E. L. A. Convention. The writer is manager of the Valley Electrical Supply Company at Fresno, California.—The Editor.)

For several years the Association has had, through its commercial section, a committee on wiring of which Mr. R. S. Hale of the Boston Edison Company has been chairman. We have been favored from time to time with reports from this committee and the results which have been accomplished through their efforts are conclusive proof that this subject is a very live and important one. Their work, as you are well aware, has been devoted to an attempt to provide wiring methods to take care of the cheaper class of consumer and in addition they are largely responsible for the present standardization of plugs and receptacles. They are at present working on a proposition of the standardization of plugs and terminals for heating devices.

Quoting from their 1917 report, Section 13, "Connection Between Inside Wiring and Outside Lines": "It has been known for some years that the rules of different companies governing the connection between inside or outside wiring and the outside lines, and also the rules about customers' installations, such as those governing voltage of motors, etc., are on the whole substantially the same, but that

they differ in many small details, and differ very much in their form and wording.

"Since many wiring contractors, and most architects work in districts supplied by different companies, this means that each of them must become familiar with many sets of rules."

I would particularly call your attention to two items touched upon by the committee: first, that wiring contractors and architects working in different districts must become familiar with many sets of rules, and second, that due to the diversity of these sets of rules, the work of the wiring contractor and architect is more complicated and tends, therefore, to increase the cost of wiring.

The cost of installing electrical work is no exception to this rule of increasing cost, and if any standardization of devices or methods will tend to reduce this cost, any work done by this committee will not have been in vain. At the present time any work installed in this state is subject to the following sets of rules (and similar conditions are prevalent throughout the entire territory covered by the Pacific Coast Section):



1. The rules of the Board of Fire Underwriters, known as the National Electric Code.
2. Any amendments which may have been made to this code by local authorities where electrical ordinances are in force.
3. The rules of the Industrial Accident Commission, commonly known as the Electrical Utilization Safety Orders.
4. The rules of the central station supplying current.

The interpretations of inspectors working under these rules are not at all uniform even within the confines of any particular state. It would seem that it would be possible to evolve a code of practice embodying all of the above factors so that the architect and contractor would have one common, definite standard to which they could work. I can readily understand, however, that from the standpoint of the central station there would necessarily have to be modifications introduced, particularly in conjunction with service connections to fit their peculiar local requirements, but I feel that in the consideration of the whole subject, this would be a comparatively small item. In this code of practice the following standards might well be incorporated. The list as given is but a partial outline of the points which beset many contractors and architects who are endeavoring to plan electrical installations in different portions of any particular state. I am only endeavoring to list those which stand out in relief.

1. **Services:** This standard should embody requirements which cover the entrance point for overhead or underground services, the point at which the contractor should terminate his wires, the manner in which they should be terminated, and the question as to whether or not conduits will be required for service entrances.

2. **Meter Locations:** This should embody the space required for meters of various types, the space required for current or potential transformers, height of service switches above the ground, the type and style of service switches, whether or not meter trims are to be required, the height of meters above the ground. In this connection it might be interesting to note that companies operating in the state of California alone have a variation of 1:4 in the space required for meters, and also that the same companies have requirements permitting meters to be located from any point seven feet above the ground down to within 12 inches of the ground.

3. **Transformer Vault:** The question of transformer vaults is one that seems to be quite perplexing at the present time, due to the large number of industrial developments in the state requiring large blocks of power. This standard should embody the space required for transformers, the method of ventilation of the vault, the location of main line oil circuit breakers, if required, and the points at which the contractor is to terminate his wiring.

4. **Method of Installation of Wiring:** This standard is one which has led to a great deal of dispute in the past. A method of wiring which appears to be absolutely safe in one community will be just as absolutely condemned in the adjacent community. The mooted question as to what circuits should be required to be in conduit and what should not has probably led to as many disputes as any other, excepting that relating to service switches. The National Electric Code at the present time recognizes the following methods of wiring:

1. Cleat work.
2. Wooden moulding.
3. Knob and bushing work.
4. Armored cable.
5. Metal moulding.
6. Metal raceways, either flexible or rigid.

My own personal belief is that cleat work and wooden moulding are practically obsolete and I fully anticipate that these methods of wiring will be abandoned within a very short time. In some cities armored cable is absolutely prohibited and they even look askance at the use of flexible steel conduit. While, from some standpoints, rigid iron conduit might be the desideratum, we must absolutely recognize that

it is the most expensive type of wiring to install. It has been customary in most large cities to insist that this type of wiring shall be installed inside of the fire limits or high value districts and there also appears to be a tendency at the present time to insist that all wires operating at a voltage of over 350 shall be installed in the same manner. Any standard which contemplates the reduction in the number of methods allowable for the installation of wiring is one that requires careful consideration, but it would seem that a common standard should be applicable throughout the entire range of this section.

5. **The Size of Outlet Boxes:** There is a lack of uniformity in this matter in two particular considerations. First, a number of communities do not require outlet boxes at all, though this practice is recommended by the National Electric Code. Second, there is no uniformity with regard to size of the outlet box itself, either in its diameter or its depth.

6. **Switch and Receptacle Height:** The question of switch height has been fairly well standardized through the medium of the symbols adopted by the National Electric Contractors' Association, but the question of the height of receptacles is one which has received very little consideration. The practice of installing receptacles in baseboards is not one which tends to make for convenience in the use of the outlet, and it might seem that work could be done along this line to standardize some height which would tend to make the receptacle more convenient for the user.

7. **Motors, Starters and Terminals:** At the present time there are central stations operating in this section which permit the throwing of 7½-hp. motors directly across the line, the common practice, however, being to limit this to 5 hp. It would seem that a standard applicable throughout the entire range of the activities of this section could be adopted on this subject. The Industrial Accident Commission have been forcing the use of enclosed terminals on all motor-driven apparatus and it would appear that this is rather desirable from all standpoints. A number of motor manufacturers at the present time are providing these terminals and inasmuch as no patent situation is involved it would appear that some common standard could be evolved for this requirement.

8. **Electric Range Services:** The question involved in this standard are those pertaining to minimum wire sizes, the location of the cut-off switch adjacent to the range and the method of connecting this to the range itself. The same observations apply to the methods used for the installation of water heaters.

It would appear that if there could be evolved a definite code of practice on the above subjects which would be adopted universally throughout this territory, it would be a tremendous convenience to the architect, the industrial engineer, and the contractor. It would tend to simplify inspection and tend toward more uniform inspection. It seems almost foolish that there should be required a main service for this type of installation, equal in carrying capacity to the total connected load. It is no uncommon sight to see the wiring contractor bring out of the building three 500,000 c.m. cables, having at 220 volts, three-wire, single-phase, a total capacity of 88 kw., and have the power company set a 25-kva. transformer and connect to the service with three No. 2's. This involves not only a tremendous waste in copper conduit and feeder switches, but also creates the impression that the electrical industry as a whole is only concerned with getting as much out of the job as possible in the form of first installation cost. In numerous cases in industrials it has put a premium on group drives as opposed to individual drives, as it increases the cost of wiring in a noticeable degree. On the other hand, if diversity factors are to be worked out for various type of installation, care should be taken to see that adequate provision is made for growth in the future.

9. **Special Hazards:** Under this classification fall certain industries which are peculiar to this state and which require special consideration. I might note among these the packing industry and the vegetable oil industry, both of which require a certain amount of special consideration, particularly the latter.

10. **Demand Factors:** A standard for demand factors, particularly for industrials and large buildings, seems desirable.

11. **Motor Wiring Sizes:** The question of wiring sizes for motors is also one of considerable importance. Messrs. Horstmann and Tousley of Chicago have been agitating this



subject for some considerable time, and it would appear that their contentions as outlined in the various electrical periodicals have considerable weight and are entitled to our careful consideration. It might be wise to try to evolve a standard which would tend to reduce these wire sizes if it can be done with safety. There is one class of installation in particular that is penalized quite heavily in this connection. I refer to the large irrigating plant which is started maybe four or five times a season and yet must have wiring installed as though it were started many times a day.

**12. Illuminating Capacities:** There has been another development which has been noticeable in certain communities and which is of interest in this connection. I refer to the practice of certain local authorities in requiring that only a certain number of outlets may be connected to a circuit in order to allow for ample capacity for illumination purposes. I feel that this is a subject which merits our consideration.

It would appear that the logical way to work this out would be on watts per square foot basis for residences and small stores, rather than on a proposition of the number of outlets connected to any one circuit.

The foregoing is an outline of a few of the standards required in the installation of wiring. It is of course easy to criticize the apparent lack of standardization of wiring methods, but criticism without a suggestion for correction does not accomplish much.

For a number of years past the California Association of Electrical Inspectors has held meetings from time to time in an effort to make a uniform interpretation of the National Electric Code. They have accomplished this to a limited degree only as

their meetings have not covered the whole state.

At the present time the Industrial Accident Commission in conjunction with representatives from the various branches of the industry are attempting to formulate a code of practice covering not only safety rules but also fire hazard rules. This amounts virtually to a combination of the Accident Safety Orders and the National Code. This association is represented at the committee by Messrs. Lewis and Lisberger. As to the wisdom of such a combined common standard there does not appear to be any difference of opinion.

However, this does not take care of the variations introduced by central stations in different communities with regard to the subject of meters, services, demand factors, etc., and it would therefore appear to be in order for this association to appoint a committee covering the subject of the standardization of wiring methods, whose duty it would be to formulate standard recommendations covering those matters not covered by the Accident Commission committee, and to cooperate with them in furnishing information peculiar to the central station branch of the industry.

In conclusion, I wish to express appreciation for assistance in the preparation of this report, rendered by M. C. Hixson, of the General Electric Company.

## Fuel Prices and Railroad Operation

BY J. E. WOODBRIDGE

(The price of fuel oil has more than doubled during the past few years and in view of the large quantity consumed by steam railroads, electrification tends more and more to become not only desirable but an economic necessity. The following paper by the chief engineer of the Sierra & San Francisco Power Company is prepared for the Pacific Coast Section N. E. L. A. Convention under the title "Future Fuel Prices as Affecting Railroad Operation in California."—The Editor.)

The exercise of prophecy in the field of prices is beset with pitfalls, as has been shown by the totally unexpected price revolution of the last five years. However, as all business must be planned in part on future price probabilities, we are obliged to make the best attempt we can at an estimate of their trend.

In the matter of fuel in the state of California, the most pertinent data for prediction as to future prices are the trend of the last few years, including the recent history of production and consumption, with other relevant information, such as the influence of the war, probable future additional sources and markets, etc.

### Price Fluctuation

Except for the continuity of the thought, I need hardly inform readers of this paper that the price of delivered fuel oil in California has advanced during the last five years from approximately 60c. to approximately \$1.85 per barrel, the two approximations covering slight variations with locality. The figure which directly influences the production of oil in California, and constitutes the basic element of all prices to consumers, is the market price offered by the large distributing organizations to the producers in the oil fields. The price offered by the Standard Oil Company for fuel oil, that is oil having a specific

gravity between 14° and 17.9° on the Baume scale, has gone through the following changes during the last six years.

On October 3, 1914, this price dropped from 40c. per barrel to 37½c;—

June 7, 1915.....	\$0.32½
Oct. 26, 1915.....	.37½
Nov. 20, 1915.....	.40
Dec. 28, 1915.....	.43
Feb. 2, 1916.....	.48
Feb. 16, 1916.....	.53
April 1, 1916.....	.58
July 7, 1916.....	.63
Sept. 20, 1916.....	.68
Nov. 21, 1916.....	.73
May 11, 1917.....	.78
June 7, 1917.....	.88
June 28, 1917.....	.98
May 1, 1918.....	1.23
Mar. 17, 1920.....	1.48

The price doldrums of 1915 were due to the large number of gushers brought in during the years 1913 and 1914, which resulted in a production so much in excess of consumption that a stock of approximately 60,000,000 barrels of oil (nearly a year's consumption) was accumulated early in 1915. The price advances during the subsequent three years were largely due to war demands and the depreciation of our currency, which made oil field development difficult and expensive. In particular, the large jump of May 1, 1918, was made at the request of the National Fuel Administrator. The price advance



and other factors so stimulated production and controlled consumption that stock increased during a portion of 1918 and 1919 by 3,000,000 barrels. Many who have not looked further into the fuel-oil situation have reasoned, from the above, that we may rest easy as to the price of this raw material in the immediate future. However, it does not behoove power companies to "sleep at the switch." Let us, therefore, look a little deeper into the prospect.

### Decreasing Supply

On the occasion of the last price change, the California Railroad Commission criticized the Standard Oil Company of California, in response to which President Kingsbury of that company answered in part as follows:

"The Pacific Coast supply of fuel oil and of petroleum products is rapidly approaching exhaustion. Since May 1, 1915, crude oil stocks in California have decreased from over 60,000,000 barrels to 28,738,921 barrels on March 1, 1920.

"The available supply of crude oil in stock is today less than 13,000,000 barrels.

"The balance of the stocks are taken up in the factor of safety of 10,000,000 barrels, which the Petroleum Committee of the State Council of Defense found essential to the safety of Pacific Coast industries, and in the oil in pipe lines and tank bottoms which the same committee estimated at 6,000,000 barrels not available for use.

"At the present rate of consumption and of production the available stocks will be exhausted in about twelve months, at which time consumers of California fuel oil will be cut off from between 25,000 to 30,000 barrels per day."

"In 1918 the average daily consumption was 279,576 barrels; in the last half of 1919 it was 292,278 barrels; in January, 1920, 301,000 barrels and in February, 1920, 304,120 barrels.

"Superimposed on these figures is the fact that 7,000 barrels of fuel oil a day which formerly went to Arizona from California are now supplied from Texas and Mexico. The existing shortage, therefore, has developed in face of the fact that 2,500,000 barrels of fuel oil a year have been restored to the California supply.

"Added to these considerations are the demands of the navy and the United States Shipping Board.

"The former estimates its 1920 requirements on the Pacific Coast at 2,950,800 barrels, against 1,532,650 barrels in 1919. The Shipping Board has invited bids for 1920 for 4,000,000 barrels.

"The United States Shipping Board is establishing oil fueling stations throughout the world, and will supply these points from the cheapest markets. Thus California will be drawn upon or spared in the relation that California prices bear to prices elsewhere. Even at the new price this oil market is lower than many other points with which this market is in competition.

"The inevitable result will be that the Pacific Coast will be further drained of its supply by buyers who seek the cheapest market.

"Shipping Board vessels already have sought cargoes of fuel oil which formerly were obtained in Mexico, so that the Mexican cargoes could be released for the Atlantic coast.

"There is further the fact that improved refining processes will increase the volume of refined products extracted from crude oil and thus reduce the resulting residuum for fuel oil.

"The company is now installing at a cost of \$10,000,000 new processes by which it is estimated that more refined products, including gasoline, will be recovered from crude oil in such quantities that the company's production of fuel oil within a year will be necessarily lessened about 30 per cent, or 20,000 barrels a day."

Further light on the probable price trend is obtainable from the following table of production and consumption of crude oil of all gravities in and from the California fields during the last seven years.

YEAR	No. Producing Wells Dec 31	PRODUCTION	Aver. Daily Production per Well	CONSUMPTION*	Total Stocks 12/31
1912	5626	90,074,000	44	86,500,000	46,698,000
1913	5870	97,867,000	46	96,695,000	47,870,000
1914	6106	103,624,000	46	92,968,000	58,526,000
1915	6532	89,567,000	38	90,946,000	57,147,000
1916	7333	91,822,000	34	104,933,000	44,036,000
1917	8053	97,268,000	33	108,854,000	32,450,000
1918	8606	101,638,000	32	102,045,000	32,043,000
1919	9127	101,222,000	30	102,785,000	30,480,000

Examining the column headed "production," the gusher peak of 1914, amounting to over 103,000,000 barrels from approximately 6000 wells will be noted. A significant fact is that less oil was produced in 1919, in spite of a price three times as high as that of 1914. In the meantime the number of wells has increased 50%. The average production per well, of today, has gradually fallen from that of the gusher period to 30 barrels in 1919. This means that a large number of wells are approaching the marginal production below which it will not be profitable to pump them, unless the price advances. The average rate at which the production of California wells declines is fairly well established for the first few years of their life. The following table gives the average production of California oil wells by years of life in percentages of production of the first year.

1st year.....	100
2nd year.....	68
3rd year.....	51
4th year.....	41
5th year.....	33

Obviously, as the fields grow older, and the gushers become only a recollection, the wells become more crowded, the gas pressure goes down, and initial production of the new wells drilled becomes less and less year by year, a continuously expanding drilling program must be carried out to keep up a constant supply. If, on top of that, the demand increases, conditions are still more strained for the old law of supply and demand.

The future price trend would, of course, be checked in its upward career, by the development of new oil fields within reasonable shipping distances. While no one can predict positively that new oil fields will not be developed, it is highly improbable that the production of any such fields, on the Pacific Coast, will be sufficient materially to lower the California price. Freight rates from the mid-continent fields prohibit importation from that source, even if mid-continent prices were lower than our own. Mexican oil is still further out of reach on account of freight rates by any route. The only other source in sight is Colombia and Venezuela, but the probable tanker rate of a dollar or more for the 3000-mile haul will prevent this source from ever giving us cheap oil, even if the price at the source is not held high, as it undoubtedly will be by East-coast demands and by the large volume of shipping through the Canal which will in future utilize oil fuel for propulsion.

### A Necessary Development

The point I wish to make from the above data is that power development, as in the ordinary steam station, at an average efficiency of 185 to 200 kw-hr.

\*Consumption is here taken as production plus withdrawals from storage or less additions to storage, as the case may be.



per barrel, will cost for fuel alone at least one cent per kw-hr. with fuel prices of \$1.85 upwards. This figure, added to other steam operating costs and all fixed charges, makes the total cost of power so developed much higher than that of hydro power, even at present high costs of money and construction. This being the case for steam-turbine plants of reasonably fair to good efficiencies, it is much more true of the steam locomotive with its wasteful boiler and non-condensing reciprocating engine.

In other words, the cost of the fuel oil alone used in the steam locomotives in California and neighboring states, based on its value at the market (amounting to approximately \$50,000,000 per annum which will increase year by year until this fuel can with difficulty be obtained at all) will in time compel the steam railroads to seek other methods of operation, chief and most promising of which is electrical. Disregarding all other reasons and arguments for

electrification, the cost of fuel is going to force it.

Coal is, of course, a possible substitute. On a thermal-unit-cost basis, Utah coal is now on a par with oil on the Sierra grades. Much as the dyed-in-the-wool steam railroad man mistrusts electrification, I believe he would have a greater dislike for the use of coal where he has been accustomed to oil, on account of its inconvenience in firing large furnaces. Pulverization offers a possible means of overcoming these difficulties but involves many complications over the use of oil.

In view of the inability of the power companies to meet their present commercial demands, and the apparently insuperable financial program involved in meeting future demands, a large railroad load cannot be anticipated with any great degree of satisfaction. The solution, however, is obvious—namely, a railroad power rate which will finance the necessary development.

## Commercial Aspects of Railway Electrification

BY E. B. CRIDDLE, W. L. FROST, AND G. B. KIRKER

(The electrification of our steam railroads would mean not only a gain in comfort, cleanliness and convenience, but a commercial advantage that can be measured in dollars and cents. The economy and efficiency elements, and their bearing upon industrial progress are presented in the following Pacific Coast Section N. E. L. A. paper. The authors are respectively general agent and assistant general agent of the Southern Sierras Power Company, and manager of Railway Division, Westinghouse Electric & Manufacturing Company.—The Editor.)

From the commercial viewpoint of the public utilities of the Pacific Coast, the electrification of steam railroads is an interesting and important problem. The project is of itself of gigantic proportions, and is fraught with such wonderful possibilities that its consummation will have a revolutionary effect on both the electrical and the transportation industry.

The feasibility from the standpoint of economy and practical operation is not questioned. There are five essential features necessary in present day efficient steam railroad operations, viz.: size, speed, frequency, safety and economy of train movements. That each of these essentials is improved by electrical operation has been demonstrated, notwithstanding the fact that electrical operation, as so far applied, has followed the lines of standard steam railroad practice.

### Financial Problems

The financial problem involved is stupendous. The present government restrictions on the use of undeveloped water power must be greatly modified before much progress can be made. When we contemplate a problem so vast as the electrification of steam railroads, we must consider all great sources of undeveloped water power, such as the Colorado river, and this leads to the necessity of government cooperation, at least to the extent of allowing private interest to develop this power without being embarrassed by unmeasurable restrictions or uncertain legislation.

From the commercial standpoint the desirability of new business to the electric utility is measured by the ultimate effect upon the net revenue as compared with the investment involved. This of course

is affected materially by the cost and difficulties of service, the power factor, load factor, effect on daily and yearly system peaks. The available power supply must also be considered.

### Central Station Facilities

While indications at the present time point to the fact that most, if not all Pacific Coast central stations are going to be exceedingly busy for some years, providing enough additional power to take care of the business that is voluntarily coming on their lines, due to the natural growth of this country and the establishment of many huge manufacturing projects, we should not lose sight of the fact that the central station is the proper and most feasible source of power supply for that service. It is obvious that a central station can render this service much better than the railroad can do itself, principally from the point of continuity of service. A railroad operating its own plant would have to provide capacity to take care of its maximum demand, whereas the central station already has such capacity or would develop it and would depend upon the diversity of its other loads to provide for occasional high demands from the railroad. There is also the advantage on the part of the central station that it has a number of sources of power which insure a continuity of service which could not be guaranteed by the railroad operating one or two plants. Railway owned generating plants would mean a duplication of capital invested and needless duplication of effort. A profitable contract with a railroad for a term of years would no doubt enable the central station, properly protected by the government, to undertake developments which otherwise might be difficult.



The magnitude of the load will justify certain very large hydro developments requiring many millions of capital which are entirely unfeasible without some such big load as the electrification of railways will provide. These hydro developments would be on such a scale that the average cost of all the energy distributed by a company operating them would be kept below any other possible costs and this would attract and help build up other and more profitable business.

If handled in connection with a large system, the diversity of the combination enables the power company to make rates profitable to itself which at the same time would effect a decided saving for the steam railway as well as the general consumer.

The load factor of railroad operation is generally not good, so a very low rate is not justified, as so much of the generating and transmission capacity must always be tied up that the standby costs would necessarily be heavy.

#### Industrial Benefits

A natural sequence of the electrification of railroads will be the installation of electrically operated refrigeration units in freight cars, used for perishable products, doing away with the cumbersome icing and re-icing methods in vogue today. Perishable produce can be shipped from isolated stations direct to market in electrically refrigerated cars, thus saving freight and handling to and from pre-cooling plants, making available the dead haul and space required at present for icing cars, and avoiding the delay in transit for re-icing.

From a general public standpoint, the railroad electrification is desirable for a number of important reasons. One of the most important of these reasons is the saving of fuel, the necessity for which has been greatly emphasized during the past few months. It should be remembered that practically one-fourth of all of the fuel produced in the United States today is for railroad use, and that the handling of this vast tonnage alone forms a very considerable part of the railroad traffic. Where hydroelectric power exclusively would be used, for railroad electrification, fuel would be entirely supplanted, and even if it were necessary to produce steam generated electric power, fully 50% of the present fuel requirements would be saved. Not only does this fuel problem involve a tremendous cost in its movement for railway use, as well as a high cost for its production, but as we have recently learned, extreme difficulty is often experienced in securing an adequate supply.

#### The Working Force

It is important to note that progress so far in the matter of steam line electrification has been due almost entirely to the efforts of the electrical men who were required to adjust electrical operation to steam line practice. There is no question but what each of the five operating essentials specified in the foregoing could be vastly improved by electrical operation if steam line officials were properly educated

in the correct application of electric propulsion to train movements. In working up new business of this character it is important to impress upon railroad officials, if they are not now so impressed, the fact that electrification is an evolution which will eventually come, and that the present day system of train operation must be changed, where necessary, to meet the new conditions. With a knowledge of the proper use of electricity as a prime mover and with their present knowledge of general railway operations, these railway officials will quickly work out ways and means of efficient train operation.

#### A WOOD STAVE PIPE LINE



This pipe line, constructed by a Montana power company, has been found more advantageous than flumes or ditches in carrying water through mountainous regions from the reservoir to the power house.

An interesting feature of the Big Creek development of the Mission Range Power Company of Montana is the pipe line which carries the water to the power house from the reservoir. Instead of following the usual procedure of conveying the water by ditches and flumes to a point on the mountain directly above the power house and emptying into a forebay from which the penstock leads, the Mission Range Power Company decided to construct a wood-stave pipe line from the dam to the head of the steel penstock. The line is laid along a steep north hillside and a ditch would have taken a great amount of excavating to get material enough for a berm. There would also have been a great number of flumes necessary to cross the many ravines.



# Average Force Between Revolving Electrons

BY DR. A. C. CREHORE

(The study of attraction between crystals gives us new and interesting information as to forces in electron groups under the discussions set forth in this article by the author, who has awakened a wide interest throughout the industry in this series on "The New Physics" which has been appearing serially in the columns of the Journal of Electricity during the past several months.—The Editor.)

The equation that has been given above as representing the average gravitational force between two revolving electrons has shown, so far as we have gone, that the force is directly proportional to the product of the masses and inversely proportional to the square of the distance, and that the magnitude of the force is in approximate agreement with the true gravitational force. There is one more feature of the law with which it must agree before we can accept it as representing the complete force, and this is the fact that crystals, too, are known to obey the same law as other kinds of matter. That is to say, the weight of a crystal is independent of the way we hold it with respect to a plumb line, or the attraction of two crystals for each other is independent of the orientation of their axes relative to each other. These facts have been fairly well established experimentally, and the gravitational theory must show how this can be possible.

## Attraction Between Crystals

The gravitational equation, which has been used thus far above, was derived on the supposition that the orbits of the two electrons, with which it deals, are turned in every possible way with respect to each other, and an average has been taken. In a crystal, however, the axes of the electrons cannot be assumed to be turned in every possible way with respect to each other. We are, therefore, obliged to go back to the original equation, from which the one we have been using was derived, to find an answer to this phase of the subject. The equation in question is

$$F_r = \frac{1}{3} m_e e^2 \beta_1^2 \beta_2^2 r^{-2}.$$

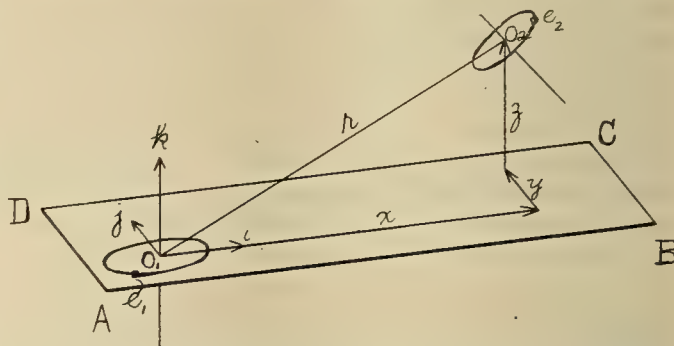
But this in turn came from taking the space average of the following equation, which represents the time average of the force for one fixed position of the two orbits only, namely,

$$F_r = \frac{1}{2} e^2 m_e \beta_1^2 \beta_2^2 [1 - (-X \sin \alpha + Z \cos \alpha)^2] r^{-2}.$$

In this equation the  $X$ ,  $Z$  and  $\alpha$  serve to fix the positions of the two orbits in space relative to each other. The equation represents the force of attraction that the second electron exerts upon the first on the average, this average being taken for a large number of revolutions of both electrons in these fixed orbits, the whole force being resolved along the line joining the centers of the two orbits, this being the fixed distance,  $r$ . The  $X$  and  $Z$  are the direction cosines of the position of this center line referred to three rectangular axes,  $i$ ,  $j$  and  $k$ , passing through the center of the orbit of  $e_1$ , the first electron. A reference to Fig. 1 may serve to make this clear.

The orbit of the first electron,  $e_1$ , is shown in perspective as an ellipse lying in the horizontal plane,

ABCD. The instantaneous position of the electron in this orbit is shown at  $e_1$  revolving about the center,  $O_1$ . The three rectangular axes,  $i$ ,  $j$  and  $k$  of unit length along which directions the distances  $x$ ,  $y$  and  $z$  are measured, as representing the coordinates of the position of the center of the orbit of  $e_2$  are shown having their origin at  $O_1$ . The direction of the  $k$  or  $z$ -axis is perpendicular to the plane of the orbit, namely, ABCD. The arrow through the center of the orbit of  $e_2$  at  $O_2$  is supposed to be perpendicular to the orbit of  $e_2$ , which is shown at the right of the figure also in perspective as an ellipse. This plane in general intersects the plane of  $e_1$  when produced in some line, and the direction of the  $j$  or  $y$ -axis is chosen so as to be parallel with this line of



In the above figure the orbit of the first electron,  $e_1$ , is shown in perspective as an ellipse, while the instantaneous position of the electron is shown at  $e_1$  revolving about the center  $O_1$ . The arrow through the center of the orbit  $e_2$  at  $O_2$  is supposed to be perpendicular to the orbit of  $e_2$ , which is shown at the right of the figure also in perspective as an ellipse.

intersection. So the direction of the  $i$  or  $x$ -axis is also determined, this being perpendicular to both the  $j$  and  $k$ , or the  $y$  and  $z$ -axes. The  $i$  and  $j$ -axes thus both lie in the plane ABCD.

The angle  $\alpha$  is that between the axes of the two orbits, or, which comes to the same thing, that between the planes of the two orbits. From this definition of the  $i$ ,  $j$  and  $k$ -axes it is evident that the direction of the  $k$ -axis alone remains fixed for any and all positions of the orbit of  $e_2$ . If the position of the orbit of  $e_2$  is changed without changing the position of its center the  $i$  and  $j$  axes may be made to rotate around in the plane ABCD because the  $j$ -axis is always parallel to the line of intersection of the two orbits.

## Relation of Equations

Briefly, it may be stated that the last equation above becomes exactly equal to the preceding, if the numeric  $2/3$  is substituted for the whole bracket in the last equation. This numeric  $2/3$  is obtained as an average value if we give to the orbit of  $e_2$  all possible positions at one fixed distance,  $r$ , between the centers of the orbits, the locus of the center of  $e_2$  describing a sphere with  $O_1$  as center,



and at each point of this sphere the orbit of  $e_2$  takes all possible orientations.

The first equation may, therefore, be used in general for the average force between the two revolving electrons when their axes may be considered to have an average or mean position, but the second equation must be used when the directions of the axes are fixed and specified as they are in a crystal.

### Force in Electron Groups

And again, it may be stated that, if we put in place of the single orbit  $e_2$  four different orbits having their axes inclined to each other in accordance with the four medial lines of a regular tetrahedron, then the average force due to the group of four electrons is fixed and constant, and is independent of the orientation of the group of four electrons, provided they preserve their relative directions among each other. Moreover, the average force due to a single electron in the group of four is obtained by giving the bracket in this equation the value  $2/3$  as before.

It follows from this that any two bodies made up of such groups of four electrons will behave exactly the same as any other two bodies, and be independent of the orientation. Now, this is exactly

the arrangement of the axes of the atoms in the class of crystals belonging to the cubic or isometric system. This can be shown quite independently of the particular form of electromagnetic theory applied to the case, and is, therefore, probably true. It is proved by assuming that there is a tendency on the part of any atom to turn the plane of rotation of every other atom until it comes into parallelism with itself, when the turning moment of force vanishes. Coupling this principle with the known locations of the centers of the atoms in these crystals, it follows that they are grouped in four equal quantities, and that each group has its axis parallel with one of the medial lines in a regular tetrahedron.

This class of crystals, therefore, satisfies the condition that the weight is independent of the orientation of the axes of the crystal according to the above equation. Nothing can, as yet, be said of the other classes of crystals, and so there must be left a single exception to the law simply because we do not know anything about the directions of the axes of the atoms in these crystals as yet. When it is shown that all crystals may thus be divided into four equal groups of electrons, the law will be general in every particular.

## Office Records—Their Filing and Indexing

BY IRENE WARREN

(The method of subject filing is discussed in this number of the series of articles, by the president of the Chicago School of Indexing and Filing, being published in the Journal of Electricity. The decimal plan of classification used by the War Department is explained in detail.—The Editor.)

### SUBJECT FILING

In the majority of firms and organizations most of the references to the files are made by the names of firms or individuals that have written the letters. Only a few letters are referred to by subject and these may be grouped under a very small number of headings. As has already been shown a few such subjects may easily be cared for in an alphabetic name file. A file of letters grouped under the names of items manufactured or sold can hardly be classed as a subject file—names of such articles are dealt with much as names of firms or individuals.

In highly specialized lines, however, it is best to group most of the letters according to a subject arrangement, such as files for an engineer or for an industrial relations department in a large corporation. Frequently clippings, statistics, and data in various forms are kept with such correspondence.

There are two accepted methods of arranging a subject file: one is to assign a word or short phrase to each item which will describe it as accurately as possible. These descriptive words which are called subject headings, are arranged alphabetically like the words in a dictionary. The other method is to prepare a scheme for the classification of the materials, which shall allow for ten main groups each of which is divided into ten groups, thus making one

hundred groups and so on, dividing any one group by tens until the divisions are as fine as the given group requires. To such subjects a decimal scheme of numbers is attached. Each item is marked with the decimal number which places it in the proper subject index group.

### Dictionary Arrangement

In the alphabetic subject, or dictionary arrangement, a card index should be made of the subjects assigned and also of the cross references used so that materials will always be filed under exactly the same word or phrase and no synonymous or allied terms will be used unless needed. The introduction to the American Library Association List of Subject Headings will give a very good idea of the way a cataloguer keeps track of the subject headings used in a library catalogue and the same principles should be applied in assigning subject headings to a subject letter or data file. Subject headings may be coded in much the same style as names are coded, each item being marked with the code number of the subject under which it is to be filed. The code numbers are a great help in sorting and putting away the material. If the subject headings are few in number, the numbers used in one of the divisions of the alphabet in a single code scheme, such as has already been described, will serve nicely. If the subject

SAMUEL TAYLOR says: "If I am not at the Pasadena Convention kindly send violets"



headings are numerous, it will be better to use a letter and number scheme which will permit greater expansion, such as the Cutter Author Tables which the librarians use for assigning author numbers in arranging books.

### Decimal Classification

The first decimal classification of subjects, and by far the best constructed one, is that devised by Mr. Mevil Dewey for the classification of books in libraries. The first edition appeared in 1873, since which time, Mr. Dewey and many of the librarians of the country have given it continuous study and from time to time enlarged and revised editions have been printed. Between eighty and ninety per cent of all organized libraries in America of varying sizes, and libraries widely differing in the character of their books, use this classification.

There is no universal subject scheme of classification worked out for business files, and the Dewey Decimal Classification is not adapted to such needs. Several attempts have been made to devise a decimal classification for a certain line of business, such as the Williams classification for railroad offices, but on the whole, each firm works out its own plan and these are usually based on the Dewey Decimal scheme. The person who contemplates starting a decimal file is urged to study the Dewey Decimal Classification and one of the more elementary books on cataloging used by librarians. Both cataloging and classification are a science. Librarians have the knowledge of the method of procedure for indexing and filing, but they rarely have sufficient business knowledge and experience, so that at present there are many compromises to be made. At present, the best person to construct a subject file is the librarian who has had a thorough course in filing and indexing and some practical experience in business filing.

Among the many points which have been so masterfully handled in the Dewey Decimal Classification and which should be considered in constructing any classification, the following should be noted:

1. The careful selection of the ten main groups and logical subdivision of each of these groups by tens so as always to proceed from the larger to the smaller subject and to provide for a logical sequence of allied subjects when possible.
2. The provision for expanding subject matter in various subdivisions and for collections of varying size without changing the relative location of the subjects.

A suggestion of how the subjects are subdivided and the numbers built up, is given in the following tables from the Dewey Decimal Classification.

First Summary	Second Summary, Showing Divisions of the 300's
000 General works	300 Sociology
100 Philosophy	310 Statistics
200 Religion	320 Political science
300 Sociology	330 Political economy
400 Philology	340 Law
500 Natural science	350 Administration
600 Useful arts	360 Associations and institutions
700 Fine arts	370 Education
800 Literature	380 Commerce, Communications
900 History	390 Customs, Costumes, Folklore

### Third Summary, Showing Subdivisions of 370

- 370 Education
- 371 Teachers, methods, and discipline
- 372 Elementary, Kindergarten
- 373 Intermediate
- 374 Self education and culture
- 375 Curriculum
- 376 Education of women
- 377 Religious, ethical and secular
- 378 Colleges and universities
- 379 Public schools, State education

The following plan shows how the number for the History of Elementary Education in England (372.942) is formed:

300	Sociology					
370	"	education				
372	"	"	elementary			
372.9	"	"	"	history		
372.94	"	"	"	"	Europe	
372.942	"	"	"	"	"	England

### War Department Plans

Many decimal plans of classification were constructed by different departments of the Government during the war. The following scheme shows the first Summary of the classification used by the War Department, also the one division in the second Summary and one complete section.

First Summary	Second Summary — Supplies and Equipment
000 General	400 Supplies and equipment
100 Finance and accounting	410 Building material and hardware
200 Personnel	420 Clothing, equipage, toilet articles
300 Administration	430 Subsistence stores
400 Supplies and equipment	440 Medical, surgical, and veterinary supplies, equipment and instruments
500 Transportation	450 Supplies and equipment for transportation by land
600 Buildings and grounds	460 Other supplies
700 Medicine, hygiene, and sanitation	470 Armament and ammunition
800 Rivers and harbors	480 Rentals and services other than personal
900	490

### Complete Section for 420

- 420 Clothing, equipage, toilet articles
- 421 Uniforms
- 421.1 Hats, caps, helmets
- 421.2 Coats, jackets, overcoats
- 421.3 Shirts
- 421.4 Breeches and trousers
- 421.5 Shoes and leggins, boots, overshoes
- 421.6 Chevrons, cords, stripes, cap bands, brassards
- 421.7 Ornaments, insignia, letters, coat buttons, medals, ribbons, badges, rosettes
- 421.8 Special measurement.

### Type of Guides

The guides used for both the dictionary and the decimal arrangements are either manila tabs, or metal tabs with the inserts, the tabs in the first two or three positions to the left. In the dictionary scheme, the subject headings are typed or printed for the tabs; in the decimal scheme the numbers for the subjects are also given and the main divisions for the first summary are placed on a colored background so as to make them stand out clearly. Tab folders like those used for the regular correspondents' folders in name files are used in both kinds of subject files; the number and subject are given on



the tab. If there are few cross references, they are made on colored sheets arranged alphabetically on the files, but if there are many it is necessary to make a card index.

In the dictionary arrangement, the detailed subjects stand in alphabetic order and subjects standing next to each other may be quite unrelated, but it has the advantage that the user may go directly to the files and to the name of the subject he wants. In the decimal arrangement, the subjects develop in logical sequence and the scheme of classification must be consulted to find the papers unless the plan is simple and small enough to be remembered. The whole scheme for the file must be worked out before the classification of the material is undertaken. It is a good plan to have the decimal plan typewritten or printed in a loose leaf book-form with a full alphabetic index.

## Western Ideas

IMPORTANT SUGGESTIONS and communications, if verbally made, are often forgotten or lost. In the offices of a certain company the employees are

DON'T SAY IT—WRITE IT			
SMITH, HINCHMAN & GRYLLS		Order No.	
INTER-OFFICE COMMUNICATION		Date	
Mr.	Mr.	Mr.	

A striking heading reminds employees of the only efficient means of inter-office communication

continually reminded of this fact by means of the heading, "Don't say it—Write it," which is printed across the top of all inter-office communication blanks. Thus the blank itself reminds the employee that it should be used.

EVERY CUSTOMER of a power company receives one thing—the regular monthly bill. This simple fact has been capitalized by the British Columbia Electric Railway Company, which is running a series of "Talks on Electric Service" on the back of its bills.

The home already using electricity is the most fertile field for further advertisement. And so these little announcements which reach every customer, every month—are effective advertisements as well as creators of friendly relations between the company and its patrons. Following are three numbers of the series which have already appeared:

### Is Our Service Satisfactory?

Is our service lacking in any respect? If so please oblige by reporting it to us.

Our aim is to satisfy every one of our consumers. We do not want anyone to nurse a grievance unheard. If there is anything at fault with our service or if you can make any suggestions for its improvement, we will be glad to hear from you.

We maintain a special adjustment bureau. You have only to ring up or call at Room 107, B. C. Electric Building, stating the particulars of your case. If a mistake has been made in rendering your bill, it will be adjusted at once. If you have a suggestion, it will be courteously acknowledged.

As we cannot become aware of faults or omissions in our service without your bringing them to our attention, we hope to have your co-operation. Only in that way may we bring our service more nearly to the standard of efficiency and courtesy which is our aim.

B. C. ELECTRIC RAILWAY COMPANY.

### Solving the Domestic Problem

Some people have always had a servant. Others have had the wash lady or a woman for cleaning one day a week. Sometimes she came, sometimes she didn't.

How would you like to have a servant on call at any time, to employ as little or as much as you liked, who will never disappoint you or put up her charges?

You can have such a servant by communicating with this company. Electric service in your home means "Electric Servants." It will cook your food, do your washing, clean your house and cool your house. All the work otherwise done by a hired servant is done by this company's service.

Hundreds of Vancouver housewives have hired this Electric Servant to do their work. Why not give the servant a trial? You will be astonished to find how low its wages are.

B. C. ELECTRIC RAILWAY COMPANY.

### What Is Your Eyesight Worth?

Compared with the other things you buy, electric light is one of the cheapest commodities on the market.

Not only has the cost of current gone down, but the amount of light per unit of current has gone up with the invention of new kinds of lamps.

In fact, electric light is so cheap today that you cannot afford to strain your eyes for lack of proper lighting facilities.

By avoiding glare in your home, factory, store or office, by adopting suitable reflectors and shades, you can save infinitely more in your eyesight and the eyesight of your family and employees than the cost of fixtures or current.

We do not suggest wasting current. We are rather concerned in making you satisfied consumers of electricity. If you use electric light wrongly we feel the loss.

Let us advise you on your lighting problems.

B. C. ELECTRIC RAILWAY COMPANY.

COOPERATIVE ADVERTISING is making rapid strides in the West. Dealers, manufacturers, jobbers and central station men realize that advance for any phase of the industry means personal gain and so the cooperative advertisement page is appearing in the leading papers of every section.

The Vancouver Electrical Contractors and Dealers Association was instrumental in organizing this page which appeared recently in the Vancouver World. A distinct attempt is made to advertise the entire industry rather than individual shops, so that the tone of the page is one of distinct cooperation.



## SPARKS—Current Facts, Figures and Fancy

(Will a phonograph outlast a lifetime? Can a state become taxless? Can a motor, new from the warehouse, be trusted? Answers to these questions are given on the page below along with interesting facts concerning aerial transportation, work of the A. E. F. Signal Corps, the shockability of shocks, and the financial status of telephone companies.—The Editor.)

Saving up for a rainy day does not rank among America's popular sports, judging from statistics gathered by the banking houses of the United States. These show that nearly 95% of the men in this country are penniless and dependent when they reach the age of sixty.

\* \* \*

The latest type of electric-driven phonograph will last a family 2,500 years, estimating that the machine is run on an average of 1 hour per week. Gears are eliminated, the drive being transmitted from the electric motor by an endless belt to the governor and friction rolls. One of these machines was started on a continuous-running test November 16, 1916, and ran continuously for eighteen months. At the end of this time it was operating quietly and perfectly in every way.

\* \* \*

It seems that even a motor, new from the warehouse, cannot be installed without careful inspection. A 30-hp. motor was recently set up on a pump and for a day ran like a dream. Then the bearings burned out and inspection displayed about three handfuls of wheat in the bottom of each bearing. Field trade mice had taken great care to put it there while the motor was in the warehouse. The electricians who made the installation conclude that even new motors can not be trusted.

\* \* \*

Thanks to the wireless telephone, travelers in the air will find no difficulty in communicating with the earth while on their aerial journey. Those aboard London-Paris airplanes may soon be able to call up London by wireless telephone and be connected directly with any telephone subscriber in the city. This is to be made possible by a wireless station with a 1,500-mile range installed on the top of the new air ministry building in the heart of London, which is now nearing completion.

\* \* \*

The most fanciful of transportation dreams is about to be realized. A passenger airship service is being arranged between the United States and England. The plans are for airships carrying 150 passengers, in addition to staffs of cooks, stewards and crew. Perth, Australia, will also be served, seven days being allowed for the trip from England to that place. In going from America to England, passengers will be landed at Liverpool and there be transferred to smaller aircraft and taken to their destination. It is pleasing to know that moorings will be provided at the leading hotels.

\* \* \*

A "Census of Electrical Industries" which has been taken at intervals of five years for some time,

is valuable as a record of development which has taken place in this field. The report taken in 1918 shows that while the revenue of the telephone companies has been more than doubled during the decade 1907-1917, the expenses have increased at an even more rapid rate. Much of the increase in expenses was due to increase in salaries and wages paid. These had advanced from 47.4 per cent of the total expenses in 1912, to 54.2 per cent in 1917.

\* \* \*

The Signal Corps of the A. E. F. holds a record of having erected 1,724 miles of permanent pole lines and of having strung 20,708 miles of wire. A system, made up of these lines and those rented from the French, consisting of 37,944 miles of wire, was maintained and operated by the Corps. With this system there were 260 telephone exchanges connecting with 8,152 telephone subscribers' stations. From the latter part of 1917 to January 1, 1919, there were handled in the A. E. F. over the Signal Corps system a total of 7,601,647 telegrams, 870,148 long distance telephone calls, and 25,184,500 local telephone calls.

\* \* \*

From time immemorial death and taxes have been decreed life's two inevitables. And now Wyoming is about to deny the fact. She is blithely looking forward to the day when she shall consider herself a taxless state. Today Wyoming is receiving oil royalties at the rate of \$2 per minute, or something over a million dollars a year. By the end of the year her treasury will be taking in at the rate of a million and a quarter per annum and by this time next year the amount will be around three million dollars per annum. In three years the state should be free entirely of all taxes for state purposes and have plenty on hand for such interesting improvements as state highways and universities.

\* \* \*

Unexpected shocks are much more shocking than expected ones. The foregoing remarkable discovery is a result of war-time experience in connection with electrified wire fences. Observation showed that a shock which was likely to prove fatal if received unexpectedly was harmless when anticipated. Experiments on animals have confirmed this impression and were also instrumental in showing that the psychological effects of shocks administered with direct and alternating current are distinctly different. It is also remarked that a close resemblance to death after shock should not be accepted too readily as proof. Persons apparently dead have not infrequently recovered when artificial respiration was applied. It is best to give the victim every benefit of the doubt.



# PERSONALS

**George E. Quinan**, chief electrical engineer of the Puget Sound Power & Light Company at Seattle, has been made chairman of the Seattle Section of the American Institute of Electrical Engineers. Mr. Quinan has in past years performed able work in the matter of standardizing electrical installations in the Northwest, and has also had a substantial part in installation of the electrical supply of power for the new railway electrification of the Chicago, Milwaukee & St. Paul Railway in its entrance over the Cascade Mountains into Seattle.

It is believed that the Institute affairs in and about the Northwest district will receive an unusual impetus under his able supervision.

**W. H. Roberts**, general manager of the General Electric Company in Cleveland, Ohio, was in San Francisco recently.

**A. N. Kemp**, vice-president of the Southern California Edison Company, is spending a few days in San Francisco.

**W. C. Morrell** of the Graham-Reynolds Electric Company, Los Angeles, spent several days recently in San Francisco.

**J. B. Miller**, president of the Southern California Edison Company, Los Angeles, was a visitor in San Francisco during the past week.

**W. G. Watson**, managing director of the W. G. Watson & Company, electrical engineers and merchants, Sydney, Australia, is now in San Francisco.

**E. A. Wilcox**, of the Pittsburgh Electric Furnace Corporation of Pittsburgh, is a recent visitor in San Francisco. Mr. Wilcox is expecting to go north before returning East.

**L. E. Voyer**, illuminating engineer for the General Electric Company, has returned to San Francisco after spending several weeks in Los Angeles in the study of lighting conditions.

**F. G. Cottrell**, chief metallurgist of the U. S. Bureau of Mines and inventor of the famous Cottrell electrical process for collecting solid particles in outgoing gases, is a recent San Francisco visitor.

**A. D. Curtis**, president of the National X-Ray Reflector Company, is taking a vacation in Southern California. He will spend some time at Coronado and will visit San Francisco on his return to Chicago.

**G. F. Kirkpatrick**, manager of the appliance department of the Pacific Northwest for the Pacific States Electric Company, has resigned his position and taken up similar duties with the Electric Appliance Company, Seattle.

**F. E. Petit**, of the legal staff of the Southern California Edison Company, has resigned to accept a position as Assistant General Counsel for the Salt Lake Railroad. He will also serve as General Attorney for California for the same organization.

**A. M. Perry**, engineering editor of the Electrical World, is visiting various Pacific Coast cities, and expects to spend considerable time in San Francisco during early May, and later will be in attendance at the electrical convention in Pasadena.

**F. P. Vose** of Chicago, secretary of the National Electrical Credit Association, is visiting the West. Mr. Vose addressed the fifteenth annual meeting of the Electrical Credit Association of the Pacific Coast on April 15th.

**A. K. Baylor**, of the New York office of the General Electric Company, arrived recently in San Francisco accompanied by his wife and daughter. Mr. Baylor is in the West on business for the Edison Electric Appliance Company, of which he is director.

**F. E. Johnson, Jr.**, representing the M. W. Kellogg Company of New York City, is a recent San Francisco visitor. Mr. Johnson is visiting a number of the larger Pacific Coast cities prior to attending the convention of the National Electric Light Association at Pasadena in May.

**E. O. Edgerton**, president of the California Railroad Commission, is scheduled to give one of the leading papers at the forthcoming N. E. L. A. Convention at Pasadena, where he will speak on "Reward for Efficiency in Utility Service." This paper will undoubtedly awaken wide interest from many quarters.

**I. W. Alexander**, advertising manager of the San Joaquin Light & Power Corporation, has left for New York City where he is accompanying **A. E. Wishon**, assistant general manager of the corporation and also president of the Pacific Coast Section, N. E. L. A., in his tour of the East in behalf of the self-interest idea as announced in the last issue of the Journal of Electricity.

**Myles B. Lambert**, for many years actively connected with the work of the Westinghouse Electric & Manufacturing Company, was recently appointed manager of the railway department of the company. In 1901 Mr. Lambert joined the Westinghouse forces and since that time he has occupied several positions in the railway department. The last one, previous to his promotion, was that of assistant to manager.

**W. L. Goodwin** of the General Electric Company, with headquarters in New York, and **Samuel Adams Chase**, of the Westinghouse Electric & Manufacturing Company of East Pittsburgh, are expected on the Pacific Coast to attend the various electrical conventions during May. On May 7th Mr. Goodwin and Mr. Chase will address meetings of the industry in San Francisco, and on May 9th in Los Angeles at the Jonathan Club. Since these men have awakened a wide interest in the merchandising of electrical ware throughout the nation, it is expected that the meetings will be interesting and well attended.

**H. A. Lemmon**, formerly sales manager with the Truckee River General Electric Company of Reno, Nevada, has recently been called to Halifax, Nova Scotia, to take charge of an advertising campaign being instituted by the Nova Scotia Tramways and Power Company, Ltd. Mr. Lemmon is well known throughout the West for the effective work in advertising he has carried out in connection with the work of his company, as well as in the service of the country as Food Administrator for Nevada. His progressive theories along advertising

lines, most pointedly expressed, have from time to time appeared in the columns of the Journal of Electricity. The Nova Scotia company, which has recently been taken over by Stone and Webster interests, is now to have the benefit of Mr. Lemmon's experience in their campaign for the bettering of public good-will.



**H. G. Butler**, Power Administrator of the Railroad Commission of California, has, by a recent order of the Commission, been given control of all of the power generated in California. Heretofore Mr. Butler has had control only over the companies operating in the north central part of the state, having taken over the duties of Power Administrator in June, 1918. He is a graduate of the University of Illinois in the class of 1906 and has been connected with several railroads in the Middle West, including the St. Louis and San Francisco, until in 1911 he went to Panama for the Government, taking charge of railroad yards there during the construction period. Since that time Mr. Butler has been with the California Railroad Commission and was assistant chief engineer when called, nearly two years ago, to assume his present position.



**L. E. Myers**, organizer and president of the L. E. Myers Company of Chicago, is a San Francisco visitor.

**F. J. Seabolt** of the General Electric Company, Schenectady, New York, was a recent San Francisco visitor.

**M. S. Slaughter** has been appointed assistant general superintendent of the Interstate Telegraph Company.

**P. R. Ferguson**, auditor of the Southern Sierras Power Company, has recently visited several of the northern California cities.

**C. F. Green**, formerly of E. L. Knight Company of Portland, Oregon, is now associated with the Astoria Electric Company as part owner, at Astoria, Oregon.

**H. A. Joslin**, manager of the Dallas, Ore., division of Mountain States Power Company, has been elected president of the Dallas Commercial Club for the year 1920.

**F. M. Hess**, formerly vice-president and general manager of the Interstate Telegraph Company, has resigned his position in order to go into business for himself.

**F. S. Mills**, electrical engineer, who is connected with the western office of the National X-Ray Reflector Company, is now doing special research work in illumination with the Famous Players Lasky Corporation.

**H. E. Plank**, manager Seattle office of the General Electric Company, has gone East to visit the General Electric factories at Schenectady, New York, and Lynn, Massachusetts. He will visit other General Electric offices en route.

**Vernon Wilder** has been appointed general superintendent of the Interstate Telegraph Company with headquarters at Bishop, California. Mr. Wilder will have full charge of all matters relating to the company, reporting direct to the president, A. B. West.

**E. G. Waters** and wife, from the Schenectady office of the General Electric Company, arrived recently in San Francisco on business. Mr. Waters is secretary of the General Sales Committee of the General Electric Company. This is his first trip to the West.

**Stacy Hamilton**, of the light and power department of the Portland Railway Light & Power Company, has returned to Portland after a trip to San Francisco. Mr. Hamilton has been in San Francisco in connection with the N. E. L. A. Water Power Committee report.

**A. C. McMicken**, sales manager of the Portland Railway Light & Power Company, is making a trip to Seattle and through British Columbia in the interest of the N. E. L. A. Convention. It is expected that he will do much to increase the size of the Northwest delegation.

**C. F. Fellows**, manager of the motor department of the General Electric Company of Seattle, **L. R. Elder**, manager of the motor department of the General Electric Company of

Portland, and **J. O. Case**, local sales manager of the Los Angeles office of the General Electric Company, were in San Francisco on business lately.

**M. A. Buehler**, formerly sales manager of the Omaha house of the Western Electric Company, has been made sales manager at the Minneapolis office. Mr. Buehler joined the Western Electric Company's organization in the early part of 1915 and became sales manager at Omaha during the fall of 1917. Mr. Buehler will be succeeded by Eliot Lum, who has been a member of the Omaha sales department since 1912.

**W. E. Robertson** of the Robertson Cataract Company, Buffalo, New York, **F. M. Bernardin** of the B. R. Electric Company, Kansas City, Missouri, and **F. S. Price** of the Pettingill Andrews Company, Boston, Massachusetts, will be in San Francisco about April 20th for a few days en route to Del Monte to attend the Jobbers' convention there.

**G. E. Stoltz**, general engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been appointed engineer in charge of the steel mill section of the engineering department.

**E. J. Barry**, electrical engineer of Tacoma, Washington, is installing a 2000-kw. turbo generator set and complete electric drive at the plant of the White River Lumber Company, Enumclaw, Washington. He is also installing complete electrical equipment for the Western Rubber Company at South Tacoma calling for about 500 kilowatts, and is changing over to electric drive the Pioneer Sand & Gravel plant at Steilacoom, Washington. The ultimate capacity will be around 800 horsepower. Mr. Barry is also installing electricity in the Martin & Gregory mill at Camp Lewis, consisting of about 300 horsepower.

**J. G. Miles** has been appointed to the position of supply division manager of the Westinghouse Electric & Manufacturing Company's Seattle office. Mr. Miles goes to his new appointment to succeed **C. V. Aspinwall**, now the company's representative at Spokane, Washington. Mr. Miles has been for some time in the supply department of the Westinghouse Company, serving for several years as the head of the insulation section, at East Pittsburgh, Pa. His grasp of the details of supply work has been responsible for the upbuilding of a considerable portion of supply sales and also for the exploitation of many new products.

**R. N. Buell**, fuel engineer, who for some time past has been engaged in special fuel investigations in California, fol-

lowing his recent war work with the California Fuel Administrator looking to the use of pulverized fuel, has left for Melbourne, Australia, where he goes for a year to install power plant work with a combined capacity of about 15,000 horsepower. He will be associated with the Commonwealth Board Mill Company, Ltd., of Melbourne. It will be recalled that Mr. Buell spent some time during 1916 and 1917 in investigations at



Seattle with Mr. Santmyer, fuel engineer of the Puget Sound Power & Light Company of Seattle. The results of their investigation have been quoted widely in the technical press throughout the country.

#### OBITUARY

**V. M. Priest** of the Advance Electric Company, Oakland, California, died recently.

**James R. Nelson**, superintendent of the San Joaquin Light & Power Corporation sub-station at Springville for the past five years, died at the Porterville hospital recently.



## Meeting Notices for Electrical Men

(The progress of the California Electrical Cooperative Campaign is reported in the following notice of the Salesmen's Auxiliary meeting. News of Denver meetings, of Northwest conventions, of San Francisco Electrical Development League activities and of Southwest meetings makes the following pages of interest to electrical men in all parts of the West.—The Editor.)

### Meeting of Salesmen's Auxiliary of Cooperative Campaign

Pledging themselves one hundred per cent behind the California Electrical Cooperative Campaign and the ideas that it is trying to get across, over two hundred manufacturers and jobbers salesmen signified their intention to do all in their power to bring the few contractor-dealers who are not yet interested in the campaign to see the advantages of it. The meeting held at the Commercial Club in San Francisco on the evening of April 1 was preceded by a dinner presided over by Mr. L. J. Brown, assistant general chairman of the salesman's auxiliary of the campaign, who put the salesmen of the jobbers and manufacturers in a receptive mood for the seed that was planted by the speeches of Lee H. Newbert, chairman of the Advisory Committee of the campaign, H. W. Angus, secretary of the campaign, A. Emory Wishon, president of the Pacific Coast Section, N. E. L. A., and D. E. Harris, a member of the Advisory Committee.

Mr. Newbert told of the history and aims of the campaign and introduced Captain Angus who sold the idea to the salesmen in a "self-interest" story by showing them just what it meant to push it for all they were worth. By showing the increase in sales of appliances due to the campaign in 1919 Mr. Harris proved that there was \$487,500,000 worth of business in California waiting for the electrical dealer if the convenience outlet idea was put over one hundred per cent. Mr. Newbert then outlined as follows the way in which the men could help the campaign:

1. Call the attention of electrical contractors and dealers to the importance of using the standard or simplified accounting systems.
2. Encourage the electrical contractors and dealers to subscribe to and read the electrical trade journals, especially the Journal of Electricity, Electrical Merchandising and the Electrical Contractor and Dealer.
3. Point out to electrical contractors that it is their duty and to their interest to see that all buildings which they wire have sufficient and proper outlets for the present and future use of electrical appliances.
4. Secure close cooperation from the jobbers and manufacturers with the power companies and contractor-dealers.
5. Assist the field men in securing membership from non-members in the California State Association of Electrical Contractors and Dealers and encourage all electrical contractors and dealers to become active in their sections or local organizations.

In bringing the meeting to a close Mr. Wishon, who is about to invade the East with his "self-interest" story at the request of Mr. McGraw, of the McGraw-Hill Company, begged all those present to bring the self-interest story to the Pasadena convention with them and to tell it to every one whom they met. For only as fast as the electrical industry in the West develops can the West develop likewise, and only as the power companies increase their systems can the field of

the manufacturer, the jobber and the contractor-dealer be enlarged to any extent.

### Electrical Development League Holds Safety Meeting

The San Francisco Electrical Development League held a National Safety Meeting at the regular luncheon hour on April the fifth. Mr. H. M. Wolfen, superintendent of the Safety Commission, was chairman of the day. Four members of the Industrial Accident Commission gave talks which related definitely to National Safety Week. R. L. Hemingway, chief boiler inspector, spoke on the subject of Boilers; G. Chester Brown, chief mining engineer, spoke on "Safety Work of the Mining Division"; J. J. Rosedale, chief construction engineer, took up the subject of "Preventing Accidents in Construction Work," and E. C. Wood, chief elevator inspector, spoke on the subject of "Interlocks for Elevator Shaft Doors."

History of Shipyard Strike Given at Electrical Development League

### History of Shipyard Strike Given at Electrical Development League

Fred C. Metcalf, secretary of the California Metal Trades Association, was the speaker of the day at a San Francisco Development League luncheon on March 29th. He gave a brief talk on the history of the shipyard strike, which has been on for six months, and on the adoption of the "American Plan" by the Association to combat the strike. Mr. Metcalf was introduced by Mr. R. A. Balzari. A. Emory Wishon of the "Self-Interest" plan was present and Robert Sibley, editor of the Journal of Electricity, told of Mr. Wishon's acceptance of the invitation of Mr. McGraw of the McGraw-

Hill Publishing Company, to come East and tell his "Self-Interest" story.

### A. I. E. E., Denver Section

Two interesting meetings of the Denver Section of the A. I. E. E. have been held during the past month. At a special meeting on April 2nd the guest of the evening was F. W. Peek, Jr., consulting engineer for the General Electric Company of Pittsfield, Massachusetts. Mr. Peek spoke on high tension phenomena, upon which subject he is considered the highest authority in the country.

At a regular meeting a paper on "Electrical Measurements," by D. C. McClure and H. P. Tewksbury, was presented. The members and guests adjourned to the laboratory of the Denver Gas and Electric Company where the paper was read and demonstrated, especially through the display of precision instruments.

### BUILDERS OF THE WEST — LXXV



A. EMORY WISHON

Far beyond the Rockies on the East and the Pacific Ocean on the West has gone the fame of Western engineers and builders in constructive effort and engineering attainment. Not alone, however, in physical structure has the West become pre-eminent, but in ethics and ideals of service it is today playing a leading part. To A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation, and president of the Pacific Coast Section, N. E. L. A., this issue of the Journal of Electricity is affectionately dedicated in lasting appreciation of his work in the "self-interest" appeal that has so enlightened citizens of the nation that they see, as never before, in the harnessing of the water powers of the West an advance in the joy of living and in profit returned to each individual citizen, in direct proportion to the kilowatt-hours placed upon the transmission lines.



### A. S. M. E., Washington Section

At a recent meeting of the Washington Section, A. S. M. E., Dean Stephen I. Miller of the College of Business, of the University of Washington, gave an address on "The Relationship of the Engineer in Successful Industrial Management."

A report from this Association mentions the formation of a joint engineering society called the Associated Engineering Societies of Seattle. The council of this society is made up of two delegates from each of the branches of the founder societies: American Institute of Chemical Engineers, Washington Association of Engineers, Pacific Northwest Society of Engineers, and the Seattle Engineers' Club.

### Synchronous Club Has Ladies' Night

Dancing and vaudeville made up the program of the Synchronous Club of Los Angeles, given recently at the Fraternal Brotherhood Hall. Over 250 members and guests enjoyed the entertainment. Following is the program:

- A—Musical Magnets: University of California Glee Club.
  - B—A Loud Speaking Phone: Earle Hefner.
  - C—Sine Curves at High Frequency: Polytechnic High Gym Club.
  - D—The Lightning Cartoonist: Bill Tanner.
  - E—Wires All Busy: Operator Earle Adams.
  - F—Two Live Wires: Philip and Yvonne Garnier.
  - G—The First Self Starter: Harry Robinson.
- Music by the U. S. Electric Jazz Orchestra.  
The vaudeville show was followed by dancing.

### Oregon Association of Contractors and Dealers

At a meeting of the Oregon Association of Contractors and Dealers on March 22, the principal appeal of the evening was for a large attendance at the N. E. L. A. Convention in May. A large number of the contractors and dealers have signed up for the trip and will accompany the central station men from Oregon to represent the northwest at the convention.

### International Mining Convention

At the International Mining Convention held in Seattle, Washington, from April seventh to April tenth, the importance of electricity to the mining industry was brought out. Mr. J. C. Ralston, an engineer of Spokane, in speaking of the

large amount of undeveloped resources of the Pacific Coast, pleaded for a greater development of water power. "In Washington it is estimated there is 2,500,000 horsepower awaiting development in water power. In Washington, Oregon, Idaho and California, the rim of the Pacific, there is upward of 7,000,000 horsepower and less than ten per cent of it has been developed. In Washington the potential water power in rivers and streams represents about sixty horsepower per square mile."

Oliver C. Ralston, superintendent of the Seattle station of the United States Bureau of Mines, discussed electro-metallurgical opportunities in the Northwest. The importance of the electrical industry in the mining field was brought out by several papers and all of them dealt with the importance of furthering the development of this greatest of all natural resources.

### State Associations to Maintain Identity When N. E. L. A. Section Is Formed

The executive boards of the Electric Associations of Colorado, Wyoming and New Mexico contemplate forming a geographic section to affiliate with the N. E. L. A. The affiliation, however, will probably be made direct through membership campaigns and not through the state associations so that these latter will not give up their identity.

A statement made in the March 15th issue of the Journal of Electricity, to the effect that the New Mexico Electric Association intends expanding to include the states of Colorado and Wyoming was therefore erroneous. The Colorado Electric Light, Power and Railway Association is a large and strong organization covering the entire state of Colorado.

### A. I. E. E., San Francisco Section

The next meeting of the San Francisco Section of the A. I. E. E. will be held at the Engineers' Club on April 30th, at 7:15 p.m. Mr. J. H. Anderton will talk on Hydroelectric Developments of the Great Western Power Company. The talk will be illustrated by means of forty or fifty lantern slides.

## HAPPENINGS IN THE INDUSTRY

### PROPOSED HOLLYWOOD LIGHTING DISTRICT

Tentative plans are being made in Los Angeles for ornamental lighting throughout Hollywood. It is proposed to establish a district comprising all the territory west of Vermont Avenue to the city limits and lying north of Melrose Avenue. Such a district would be about ten square miles in area and would have in the neighborhood of twenty-five lineal miles of lights. To date no formal action has been taken but the advocates of the system may make a definite announcement shortly.

### NEED FOR AUTOMOBILES AT CONVENTION

The chairman of the Local Transportation Committee for the N. E. L. A. Convention announces that it will be necessary to have a great number of automobiles on hand and asks every delegate who contemplates bringing his automobile to the convention at Pasadena and who will turn it over to the committee for use during the week to greatly assist the Transportation Committee by mailing at once a description of the machine and stating just when it can be used. Also it should be stated whether there will be a driver who can be called upon or if the machine will be sent and a driver to be furnished after it arrives. He asks that they get in touch with the chairman of the committee, P. H. Ducker, 1515 East First Street, Los Angeles, care of the Southern California Edison Company.

### REPORTS OF POWER COMMITTEES TO COMMISSION

At the meeting of all of the power companies with the Railroad Commission of California, H. G. Butler, Power Administrator, took the stand for the Commission and stated that with normal rainfall from then on there would be a shortage of power in this state, starting in May, of from 10% to 18%, depending on the increase in demand. Mr. Butler also testified that as far as relieving the situation, the recent rains had not helped much. Mr. L. S. Ready, assistant chief engineer of the Commission, then took the stand and testified regarding the condition of the power companies in the southern part of the state.

The following companies and representatives were present at the hearing:

- Southern California Edison Company.
- Santa Barbara Electric Company.
- Mt. Whitney Power & Light Company, represented by R. H. Ballard and H. A. Barre.
- Pacific Gas & Electric Company, represented by H. F. Jackson, P. M. Downing and C. P. Cullen.
- Southern Sierras Power Company.
- Holton Power Company, represented by A. B. West.
- Vallejo Light & Power Company, represented by A. E. Casper.
- Coast Counties Gas & Electric Company, represented by S. W. Coleman.
- Coast Valleys Gas & Electric Company, represented by W. H. Chickering and W. A. Gregory.
- San Joaquin Light & Power Corporation, represented by A. E. Wishon and G. R. Kennedy.
- California-Oregon Power Company, represented by P. B. McKee and W. M. Shepard.
- Snow Mountain Water & Power Company, represented by W. S. Graham.
- Bell Electrical Company of Auburn, represented by F. R. Bell.



Each of the power committees handed in a report of conditions in their section of the state and offered suggestions for the solution of the problems with which they are faced at the present time. The committee of north and central California made the following recommendations:

1. That the power companies in northern and central California continue to pool their power under the direction of the power administrator as heretofore.
2. Modification of the previous list of priorities. Power administrator to designate class of consumers to be deprived of service and to what extent.
3. No new annual crop irrigation load to be taken on and restrict acreage of same where electricity is to be used for the pumping power.
4. Power companies to study load conditions and determine to what extent load factors can be improved by shifting load from day to night.
5. Consideration to be given to the re-establishment of the "day-light saving" and to the "skip stop" rule on street railways.
6. Railroad Commission establish a policy with respect to taking on new business.

The report submitted by the Central California Power Committee told of the present plans to meet the existing conditions:

1. All lighting service applications to be accepted excepting those for additional display and sign lighting.
2. Priority lists of the San Joaquin Light & Power Corporation and the Midland Counties Public Service Corporation show 600 hp. signed and promised as of March 15, 1919, and they recommend this service be rendered.
3. Mt. Whitney Light & Power Company to accept no contracts for power service including ranges and water heaters after March 6, 1920, except for small installations.
4. Applications for additional power by present consumers to supply existing uses may be accepted.
5. Recommend that additional power service not applied for prior to March 6, 1920, be granted under the following conditions: power service necessary for taking care of harvested crops; small extensions to industries entirely dependent on electricity; additional sources necessary to take care of growing orchards and vineyards now being irrigated by electrical service; power installations of not more than 3 hp. for small loads where power consumption is low.

The report of the southern California power committee was principally a summing up of the surplus power each company could supply towards making up the deficit of 25,800,000 kw-hr. needed by the San Joaquin Company. They state that there will be a surplus for this company amounting to from 3000 kw. to 5000 kw. over the daily peaks and reaching as much as 10,000 kw. during the valley hours. The committee believes that it can handle the situation in southern California at present provided the Commission will issue a regulation concerning curtailment of extensions and will issue further regulations governing restrictions and limitations of source, particularly with respect to shifting the load of agricultural consumers to certain hours of the day, or days of the week, according to schedules devised to harmonize the power demand with the available supply.

#### CLEVELAND ELECTRICAL SHOW A GREAT SUCCESS

The Cleveland Electrical Show, held a short time ago under the management of the Electrical League of Cleveland, proved a far greater success than anticipated by the most optimistic of its promoters. For ten days exhibitors were continually busy demonstrating their wares to interested spectators who wanted demonstrations because they wanted to buy. An average daily attendance of more than 15,000 was recorded. At the close of the third day of the Show orders totaling more than \$1,000,000 had been booked by exhibitors.

On one day, when special attraction was provided, including the public marriage of a couple for whom an electrical hope chest had been contributed by exhibitors, more than 20,000 admissions were received. The electrical hope chest included an electrical range, washing machine, vacuum cleaner, toaster, percolator, and all other electrical devices necessary for the electrical equipment of a modern home.

Instead of turning over the management of the Electrical Show to a professional promoter the Electrical League

of Cleveland took it in charge and made various members and committees responsible for its success. Results were decidedly beneficial to the League as an organization and to the exhibitors who participated.

#### RATE INCREASES AUTHORIZED BY COMMISSION

Two important rate issues have been granted by the California Railroad Commission, one for the San Joaquin Light & Power Corporation and the other for the Mt. Whitney Power & Electric Company. In the San Joaquin decision an average increase of 11% over the 1920 rates has been allowed, which became operative April 1st. This is an increase of approximately 30% over pre-war rates. The decision declared that under the existing conditions of water shortage and in view of the extensive construction work to be done immediately to render adequate service to the public, the corporation was entitled to a return of 8% on a reasonable rate base. The commission also authorized a raise in rates to the Mt. Whitney Power & Electric Company which was equal to that granted to the San Joaquin Light & Power Corporation.

#### ANALYSIS OF COMPLAINTS TO COMMISSION

Out of a total of 748 informal complaints to the Railroad Commission of California regarding rates the electric power companies came third on the list of 137, and from 828 complaints regarding service the electric companies again rated third with 147 appeals. Considering the fact that there are approximately one million persons paying gas and light and power bills in California, the number of complaints against rates must be regarded as remarkably few and practically a verification of the Commission's claim that "the increase of rates by the Commission under the abnormal conditions prevailing is but an act of necessity, fair alike to the utility and the consumer."

#### SAFETY CODE BEING COMPILED

A set of rules for an electrical safety code is being compiled by the Public Service Commission of the state of Nevada. These are to be based on the rules of the Bureau of Standards.

Different power companies are taking an interest in the matter, and a committee has been formed consisting of F. O. Broili, engineer, Public Service Commission, chairman; E. D. Brown, Supt. Truckee River General Electric Co.; H. Shields, Supt. Nevada Valleys Power Co.; R. W. Mastick, transmission engineer, Bell Telephone Company; P. Klein, labor organizations.

#### INSURANCE GIVEN TO EMPLOYEES

The Westinghouse Electric & Manufacturing Company is issuing an insurance policy for the sum of five hundred dollars, entirely without cost, to every employe who has been in the company's service for a period of six months or more. In addition, the employes, after April first, may increase the value of their policies to amounts varying from \$1000 to \$2000, depending upon their length of service and continuity of savings.

**Erratum:** In the article by Charles H. Tallant which appeared in the last issue of the Journal of Electricity, the formula on page 318 should have read:

$$M_s (\text{Spec. speed}) = \frac{\text{r.p.m.}}{\text{head}} \sqrt{\frac{\text{hp.}}{\text{v head}}}$$



### POWER PLANT CONSTRUCTION

The construction of a power plant on Big Creek has been announced by the Southern California Edison Company. This plant will be on the San Joaquin river below the present Big Creek No. 2 plant and will be known as Big Creek No. 8.

A tunnel has been driven below Big Creek No. 2 as part of the proposed development of Big Creek No. 3. The present plan is to break out from this tunnel and install a penstock for Big Creek No. 8, after which the water will again be taken in tunnel through the mountain and dropped down through the former plant, Big Creek No. 3.

Big Creek No. 8 will have a capacity of 22,500 kw. and during the year 1921 will generate 100,000,000 kw-hr.

In addition to this development the Southern California Edison Company is actively progressing on the impounding of water in Shaver Lake, which will be capable of supplying 46,000,000 kw-hr. during the year 1921, which will be generated in Big Creek No. 2 and Big Creek No. 8.

### REORGANIZATION OF COMPANIES

Proposing to declare a stock dividend to the Poulsen Wireless Corporation, its sole stockholders, the Federal Telegraph Company, in an application filed with the Railroad Commission asking authority to issue the stock, indicates that a reorganization of the financial set-up of both corporations is in contemplation. The plan, which is said to meet with the approval of more than a majority of the stockholders of the Poulsen Company, will reduce the outstanding capital stock of the Poulsen Company and "will give the stockholders direct instead of a removed or indirect, interest in the affairs of the Federal Company."

### AUTO LINE FOR CONSTRUCTION WORK

Declaring that for several years to come it will employ a large number of men in carrying out the construction work made necessary by its plans for hydro-electric development on the North Fork of Kings River, the San Joaquin Light and Power Corporation, in an application filed with the Railroad Commission, asks authority to establish an auto line for the transportation of its employees and material from Fresno to the various construction camps that are to be established.

In its request for the certificate declaring the need of such an auto service the company points out that it has already constructed a bridge over Kings River near a point known as Maxsons, and that it has in contemplation other bridges at various points along the river, the need for which will come up as the big development project grows. Rights of way for a private road have also been secured, the general idea being to provide means of transportation for men and material solely under the control of the company, and therefore not subject to interruptions by outside traffic.

The company declares that it will limit the use of the autos to its own employees, those having business at the construction camps and to the hauling of material needed at the camps.

### REDUCTION MADE IN LIGHT WARRANTS

Revenues from the operation of the city lighting department of Seattle during the first ten months of the year 1919 aggregated \$1,634,987.57 and operating expenses \$1,310.59, according to the annual report of Superintendent J. D. Cross recently transmitted to the mayor and city council.

Substantial reduction was made during the year in the number and value of outstanding warrants. On January 1, 1919, the outstanding warrant represented \$1,090,887.36, while on November 30, 1919, the aggregate was \$886,204.82, as stated by Mr. Ross. The city paid \$37,181.45 in interest on outstanding warrants during the year.

Expenditures for additions to the city lighting plant during the eleven months ending November 30, 1919, totaled \$643,116.72, of which \$325,139.84 was paid out of the revenues and \$317,976.88 from the proceeds of bond sales.

The total number of contracts including both regular and transient, made during the year ending October 31, 1919, was 27,621.

### TECHNICAL EMPLOYMENT SERVICE

The California State Mining Bureau has inaugurated a technical employment service which is offered free of charge in the hope that practical benefit will result to those interested in the mineral industry of this state. A system has been installed whereby records will be kept of technical men who desire positions and of vacancies existing in the staffs of mining or oil companies, plants or reduction works. Companies or individuals are cordially invited to call at any of the offices of the State Mining Bureau or to communicate by mail or wire, and every effort will gladly be made to satisfy their wants.

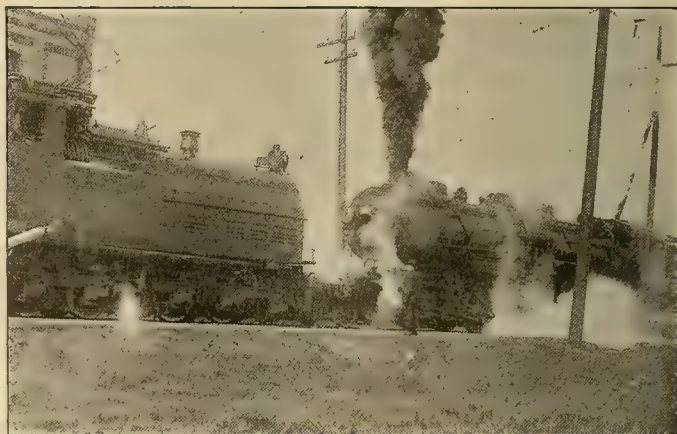
### INDUSTRIAL INSURANCE

The California State Compensation Insurance Fund has declared an initial dividend of 17½% under policies issued in the year 1919. All 1919 policyholders will participate in this dividend on the same percentage basis except that those who paid only the "minimum premium" do not participate.

The State Compensation Insurance Fund was established by the legislature for providing California employers with protection against compensation liability on a net cost basis, and for providing insured employes with a full measure of the compensation and medicinal attention to which the law entitles them.

The Fund has assets of over \$4,000,000, of which \$3,497,000 is invested in California and United States Liberty Bonds. The net surplus on December 31, 1919, was \$1,580,000 and as of that date \$1,140,924 had already been allowed in dividends to policyholders.

The net premium writings for the year 1919 were \$3,228,636.93, or approximately forty per cent of the entire compensation insurance business of the state.



Railroad history was made at Kent, Washington, near Seattle, when the mightiest of all steam locomotives, the Mallet, was matched against one of the new passenger-type electric locomotives recently installed by the Chicago, Milwaukee & St. Paul Railroad. After the two locomotives had been fastened together, the engineer on the steam engine opened wide the throttle. For an instant both engines remained stationary, then the steam locomotive began to move backward slowly but surely under the pressure of the electric locomotive. The test was made three times, resulting each time in a decisive victory for the electric engine. Railroad engineers witnessing the test explained the reason for the victory. In the steam engine there is always the moment of absolute zero between the backward and forward motion of the piston, while in the electric locomotive the pull of current on the motors is constant and the weight of the electrical locomotive can be distributed over a larger number of driving axles. Demonstration has shown that one electric locomotive is capable of doing the work performed by 2.7 steam locomotives and in this proportion the electric machines are replacing those of steam motive power.



## Convention High Lights

(Interesting information concerning the N. E. L. A. Convention comes every day from headquarters. Certain of the outstanding addresses, discussions and good times for which definite plans have already been made are summarized on the following page, which is capable of convincing the most exacting delegate that every one of the regular sessions will be well worth his while.—The Editor.)

Delegates to the forty-third convention of the National Electric Light Association at Pasadena, California, have before them four days of the busiest kind of work, with just enough recreation and entertainment dove-tailed in to keep them from going "stale."

Guests and members of the Association who are particularly interested only in the four general sessions and in one or two of the eight sectional sessions, will have the opportunity of their lives for real enjoyment of scenic trips, golf, tennis, bathing, boating, dancing, and kindred amusements all carefully planned beforehand by Pacific Coast committees already perfecting details.

A program replete with points of interest for all affiliated with the electrical industry has been prepared in such a manner that every phase of development during the last year has been covered. Prospective development during the coming year also is dealt with, and ample time is allowed for discussion of the papers and reports of committees to be presented.

The address of welcome to the N. E. L. A. will be delivered by Governor William D. Stephens of California at the opening of the convention, on the morning following the reception given by President R. H. Ballard in the Hotel Huntington, which has been chartered outright for the convenience of the delegates and their guests and which will be headquarters for the convention.

President Ballard will respond on behalf of the Association, and will deliver the president's address. He will be followed by M. H. Aylesworth, executive manager of the Association, who will outline the reorganization of the Association to date, what already has been accomplished under the reorganization, and the complete plans for the Association during the coming year.

Some of the "high lights" of the program are as follows:

Franklin T. Griffith of the Portland (Ore.) Railway Light and Power Company will present the report of the Association Committee on Water Power Development, of which he is chairman. This subject is one of tremendous importance and interest in view of the evident present necessity for increasing the production of electrical energy sufficiently to meet the existing and ever-growing surplus demand.

"Inductive Interference," one of the all-absorbing problems of the electrical industry today, will be dealt with in a report presented by A. E. Silver, chairman of the Inductive Interference Committee. A complete summary of the present conditions and problems, and recommendations for Association activities designed to further their amelioration and solution, are contained in the report and should precipitate a worth-while discussion.

"Electrification of Steam Railroads" will be the subject dealt with in the report of a committee on that subject, presented by Frank M. Kerr, chairman. Improved practices and the outlook for the electrification of the steam roads of the country are covered.

In the report, and subsequent discussion, of the Committee on Electrical Resources of the Nation, M. S. Sloan, chairman, really startling facts are expected to be brought

out. This in reality is a "key subject," since the extent of future electrical development depends upon the electrical resources and their development.

The increasing cost of fuel for gasoline engines and the tremendous increase in the use of motor vehicles for the transportation of passengers and freight, brings to an immediate issue the question of the development, manufacture and marketing of the electrical vehicle. This issue, and other phases of electrical vehicle activities will be covered in an address by George B. Foster, chairman of the Electric Vehicle Section of the Association.

Motion pictures showing the electrification of manufacturing plants, shipyards, terminals, and other industries, will illustrate a paper on "Electric Machinery for All Handling," to be read by Zenas W. Carter, secretary of the Material Handling Machine Manufacturers' Association of New York.

Concrete facts and figures on the value of proper publicity regarding activities and problems of the electric industry in particular, and of all public utilities in general, will be given in the report of the Association Committee on Public Information, of which John F. Gilchrist is chairman. Under the auspices of this committee and as the result of direct personal activity on the part of the chairman, state committees on public information have been organized by all public utilities, except steam railroads, in Illinois, Indiana, Kentucky, and are being organized in other states. The worth of the work done by these committees in making the public and regulatory body members understand some of the problems of the utilities and the inseparability of the interests of the public and the public utilities is made evident.

The importance of the fullest cooperation between all branches of the industry, for the mutual benefit of the public and of the industry, is given recognition by a place on the program in the form of a committee report to be presented by Lee H. Newbert.

A demonstration will be given of the novel effects in residence and industrial lighting which have been developed during the last year, particularly in the use of color.

### Pacific Coast Section, N. E. L. A.—Two Thousand Strong

The Pacific Coast Section of the National Electric Light Association will show a membership of at least two thousand by the time of the Pasadena Convention. A considerable portion of this large membership showing is due to the enthusiastic response of Class B members of the Southern California Edison Company, there being already nine hundred of these enrolled. Through the efforts of J. M. Buswell, head of the Inspection Department of the San Joaquin Light & Power Corporation, 119 employees of this company have joined the Association this year. Considering the size of the San Joaquin company, this compares most favorably with that of the Southern California Edison Company and carries the suggestion that some of the other electric light and power companies will have to put forth strenuous efforts in order to appear in an equally favorable light. Particular mention should also be made of the large enrollment of Class E members, employees of manufacturers, jobbers and contractor-dealers.

Previous plans for holding the Pacific Coast Section convention in the Hotel Green at Pasadena have been changed. Meetings will be held in the Hotel Huntington, of that city.

C. E. HEISE says: "It will pay to attend convention if only to be asked how you like Los Angeles"





## California Electrical Co-operative Campaign

### An Educational Campaign in Which the Various Electrical Interests Co-operate to Improve the Industry's Service to the People

(The recent activities of the California Electrical Cooperative Campaign have been directed largely towards the spreading of the convenience-outlet idea, with a view to interesting architects in this important aspect of building. Considerable progress is also reported in connection with the Standard Accounting System and the establishment of electrical pages in daily newspapers.—The Editor.)

#### REPORT OF THE ADVISORY COMMITTEE FOR MONTH OF FEBRUARY

No meeting of the Advisory Committee was held during the month of February. However, Mr. Alvord, of the Advisory Committee, went East in the interest of the convenience electric outlet campaign and the California Electrical Co-operative Campaign idea. Mr. Alvord has not returned with the report of the results accomplished.

##### Work with Architects —

Mr. Walter F. Price, who has been engaged to sell the convenience electrical outlet to architects and builders of California, began work February 1, 1920. During February he worked in San Francisco and Oakland and called upon 71 architects and 21 builders. He was received by them favorably. Of the 71 architects that he called upon only two were too busy to see him and they made appointments for later visits. Of the 21 builders visited, 17 spoke favorably of the idea.

A firm in San Francisco thought so much of the idea that it will completely wire and equip an electrical home, advertise it extensively in the newspapers of San Francisco, and use it to sell all other homes built. A firm in Oakland that is building a home every five days, will advertise these homes upon the electrical sections and endeavor to sell their homes on the electrical idea.

##### Advertising Progress —

Mr. Hixson, the advertising representative, during February worked in Oakland, Berkeley, Richmond, San Jose, Stockton, Mountain View, Sunnyvale and Palo Alto. He established electrical sections in two Oakland newspapers and in one newspaper of each of the following cities: Berkeley, Richmond, San Jose and Stockton.

##### Field Representatives —

Mr. Spring, in the southern part of the state, during the month of February visited throughout his territory with the exception of Santa Barbara. His work has been confined largely to getting the new sections of the California State Association of Electrical Contractors and Dealers started, and installing accounting systems.

Mr. Brainerd has completely recovered from his sickness and began work the 15th of February. He made a trip in February through the San Joaquin Valley, giving contractor-dealers suggestions for improvement and assisting in the organization of the new section of the California State Association at Bakersfield.

##### Contractor-Dealers and the Accounting System —

Sixteen electrical dealers ordered the Standard Accounting System during the month of February.

The last fifteen days of February the secretary spent in the south, organizing the Salesmen's Auxiliary, and meeting with the contractor-dealers of the Los Angeles, Long Beach, Santa Ana and Orange Belt sections of the State Association. He was accompanied and assisted on this trip by Mr. Spring. At these meetings 18 new members for the State Association were secured, and 9 orders for accounting systems taken. All of the contractors promised to get behind the convenience outlet campaign.

The Salesmen's Auxiliary in the southern part of the state is now active. The work of the Campaign and the Standard Accounting System was explained to all of the salesmen of the electrical jobbers of Los Angeles. The work of the Campaign will be materially speeded up by the assistance given by the jobbers' salesmen. To illustrate what can be accomplished, one jobber's salesman sold an accounting system within two hours after it had been explained to him. Practically every jobber's salesman promised to sell at least two accounting systems.

##### Increase in Appliance Business —

Eleven San Francisco and five Los Angeles jobbers have compiled figures on the increase of appliance business with electrical dealers in California during 1919. This average increase checks up favorably with reports from electrical dealers and shows that during 1919 the electric appliance business was increased over 1918 by at least 62%. A great number of distributors did not favor us with reports, but the information received should represent a true percentage increase. The figures do not give the total number of appliances sold or the amount of wattage placed on the power company lines by the activity of the electrical dealers.

#### TOTAL INCREASE OF 11 SAN FRANCISCO JOBBERS' BUSINESS WITH ELECTRICAL CONTRACTORS AND DEALERS

	1918		1919		% Increase	
	Q	W	Q	W	Q	W
Vacuum Cleaners .....	3623	218050	7549	517790	108.3	138
Chafing Dishes .....	159	66850	294	82400	85	23.3
Curling Irons .....	1183	26415	1691	41682	43	57.8
Immersion Heaters .....	631	243370	1218	480750	93	97.5
Air Heaters (600-w. or less) .....	8407	4998500	9416	5561700	12	11.3
Radiant stoves .....	4534	2710400	6359	3815400	40.2	40.7
Disc stoves .....	1015	592100	1627	1593700	60.3	169
Heating pads .....	3285	135640	4865	213540	48	57.4
Percolators .....	3185	1281740	6480	2616300	103.4	104.1
Lamp socket oven .....	166	99600	192	115200	15.7	15.6
Toasters .....	3421	1619870	6743	3252750	97	100.8
Misc. socket app. ....	4080	1743460	6571	2713400	61	55.6
3-lb. ....	2176	719800	3310	1096600	52.1	52
5-lb. ....	4694	2514000	6800	3656670	45	45.4
6-lb. ....	25710	13381845	31771	17784175	23.5	32.9
Misc. irons .....	467	167430	998	370190	113.7	121.9
Laundry and tailor irons .....	458	365400	984	769350	115	110.6
Disc stoves over 600-w. ....	203	243900	318	300500	56.6	23.2
Air heating radiators .....	665	1233900	1306	2573150	111.4	108
Ranges .....	239	1888200	536	2514700	124.3	33
Water heaters .....	159	469000	368	1056500	131.4	125
Miscellaneous .....	37	76500	98	241500	165	215.7
Vibrators .....	478	20640	1080	46030	126	123
Hair Driers .....	83	3620	137	5910	65	63.3
Drink mixers .....	29	1180	80	3410	176	189
Washing machines .....	2143	416600	6096	1196230	184.5	187
Ironers .....	116	22420	278	53100	140	137
Fan Motors .....	6674	724120	6387	822605 (Dec.)	4.3	13.6
Sewing machines .....	1185	8875	1864	76965	57.3	76.7
Other devices .....	501	20235	1432	60906	186	201.2

#### TOTAL INCREASE OF 5 LOS ANGELES JOBBERS' BUSINESS WITH ELECTRICAL CONTRACTORS AND DEALERS

	1918		1919		% Increase	
	Q	W	Q	W	Q	W
Vacuum cleaners .....	605	385875	2428	432100	301.3	12
Chafing dishes .....	34	17550	83	43580	144	148.3
Curling irons .....	1788	31673	3129	57699	75	82.2
Immersion heaters .....	298	816700	447	931850	50	14.1
Air heaters .....	1728	9007200	9983	10141155	477.7	12.6
Radiant stoves .....	1117	2668000	3714	4273300	232.5	60.1
Disc stoves .....	244	809700	352	739950	44.3 (Dec. 8.6)	
Heating pads .....	1872	98720	2764	149700	47.6	51.6
Percolators .....	1647	1619200	2237	2563180	35.8	58.3
Lamp socket ovens .....	50	30000	18	11040 (Dec. 64)	63.2	
Toasters .....	2382	1176900	4639	2332520	94.7	98.2
Misc. socket appl. ....	922	343150	2041	498280	121.3	45.2
3-lb. ....	1175	366460	1828	568740	55.6	55.2
5-lb. ....	788	395450	1372	691960	74.1	75
6-lb. ....	7972	4908875	12664	7019665	58.3	43
Misc. irons .....	81	49820	145	127325	79	155.5



Laundry and tailor irons	349	310200	654	564100	87.4	81.8
Disc stoves over 600-w.....	194	177200	269	255800	38.6	44.4
Air heating rad.....	196	419000	694	936820	254	123.6
Ranges .....	37	179000	111	621550	200	247
Water heaters .....	51	154500	44	137000 (Dec. 13.7	11.4)	
Miscellaneous .....	81	81000	59	63000 (Dec. 27.1	22.2)	
Vibrators .....	846	50060	1668	107680	97.1	115.1
Hair driers .....	25	4170	96	20400	284	390
Drink mixers .....	40	5020	67	7860	67.5	56.5
Washing machines .....	703	119500	1699	292750	141.7	145
Ironers .....	32	6400	90	16000	181.2	150
Fan motors .....	4012	282996	5818	413478	45	46
Sewing machines .....	650	37250	1422	71950	119	93
Other devices .....	210	21000	584	49750	178	137

## TRADE NOTES

## District Managers Transferred —

Several additions and changes in the sales and advertising departments of the Square D Company of Detroit, Michigan, have taken place. E. A. Printz, formerly district sales manager of the Chicago territory, has been made sales manager, A. MacLachlan continuing in the capacity of secretary and director of distribution. D. M. Stone, formerly district sales manager of the Pittsburgh territory, is now district sales manager of the Detroit territory. J. A. Jaques, formerly in charge of the New York territory as district sales manager, has been given the district sales managership of the Pittsburgh territory, and H. W. Spahn, district sales manager of the Buffalo territory, has been placed in charge of New York. D. H. Colcord, formerly of the department of publicity of the Westinghouse Air Brake Company of Pittsburgh, has been appointed director of research engineering.

## Increase of Capital —

Rome Wire Company, Rome, N. Y., have recently authorized an increase in the capital stock of that company to \$4,000,000, seven per cent first preferred, and 5,650,000 common. The shares in each issue are one hundred dollars par value. Kidder, Peabody & Company of New York and Boston are offering the public \$1,400,000 of the preferred issue.

## New Japanese Company —

The Taiwan Electric Power Company, of Formosa, Japan, recently held its first general meeting in Taihoku, Taiwan. Work on the company's plant, to be located at Lake Candidius, is about to begin. Inquiries regarding the possible furnishing of materials should be addressed to the company at Taihoku.

## New Advertising Manager —

The Radiant Manufacturing Company of Sandusky, Ohio, whose output the last two years has been entirely taken by a small number of large jobbers, will shortly inaugurate a vigorous advertising campaign to dealers and farmers. Mr. H. H. Ambrose of Iowa has been secured as advertising manager to head this new department.

## Electric Brass Furnaces —

The Oregon Brass Works of Portland, Oregon, has recently installed two Detroit electric brass furnaces. These are of the rocking type and are said to be the only electric brass furnaces of their kind west of St. Louis.

## Combination of Two Large Engineering and Construction Companies

A combination of the organizations of Westinghouse, Church, Kerr & Co., Inc., engineers and constructors, New York, and Dwight P. Robinson & Co., Inc., constructing and consulting engineers, of New York, has been announced. The new company will be called Dwight P. Robinson and Company, Inc., and will occupy executive offices at 61 Broadway and engineering and designing offices in the Grand Central Palace, 125 East 46th Street, New York.

As the activities of the two companies were largely supplemental, it is believed that the new organization will become one of the largest and most successful in the construction and engineering business.

## New Electrical Supply Store —

John M. Price, a practical electrician of Hailey, Idaho, has opened an electrical supply store in a room in the Caldwell Traction Company depot, called the Electric Shop. He is putting in a complete line of electrical goods—washers, carpet sweepers, lamps, and so forth. He will also do electrical wiring. He comes highly recommended as a first-class workman.

## Increase in Business —

The Pacific Lighting Corporation of California showed an increase in business during 1919 of 22.4% over that done in 1918.

## Change of Offices —

The general offices and headquarters of the Coast Valleys Gas & Electric Company were established in Salinas on April 1. The offices have been in San Francisco.

## Elevating and Transmission Machinery Business —

H. Deverell has sold his interest in the Deverell, Spencer Company and is now engaged in the elevating, conveying and transmission machinery business with offices at 1401 Lexington Building, Baltimore.

H. Lecour, of New York, has been elected treasurer of the Mitchell-Rand Manufacturing Company of that city. He succeeds W. E. G. Mitchell in this capacity, who will devote all of his attention to his duties as vice-president in the future. Mr. Lecour is well known in the electrical industry. He was on the staff of the First American Army in overseas service in September, 1917, and as a member of the 124th Field Artillery served in the Argonne-Meuse offensive, October and November, 1918. In June, 1919, he returned to this country.

Miles F. Steel, Pacific Coast manager of the Benjamin Electric Manufacturing Company, has announced that hence-

forth the company's business will be transacted at their new location, 580-582 Howard Street, San Francisco. Mr. Steel deserves the blame for the troubles attendant on moving to a new location, for he has built up the business to such an extent that it was necessary to take the entire four-story building to handle the greatly enlarged stock which is now being carried. Mr. Steel has been connected

with the Benjamin people since 1908 and has been in his present position since 1916. As a member of the sports committee of the National Electrical Supply Jobbers' Association he will take an active part in the convention at Del Monte, May 12-14, and help to sustain the reputation of the Western golfers.



A large California products company announces its intention of employing a chief engineer to take the responsibility of the entire mechanical department, including a great deal of construction work. The requirements for the position are stated as follows:

Age, from 37 to 42; experience in designing and erection of diversified mechanical equipment; experience in repair and up-keep of milling and quarrying machinery and equipment. He must be an able executive and must be an aggressive leader.

TAM MacARTHUR says: "It is worth traveling thirteen hundred miles to attend the convention"



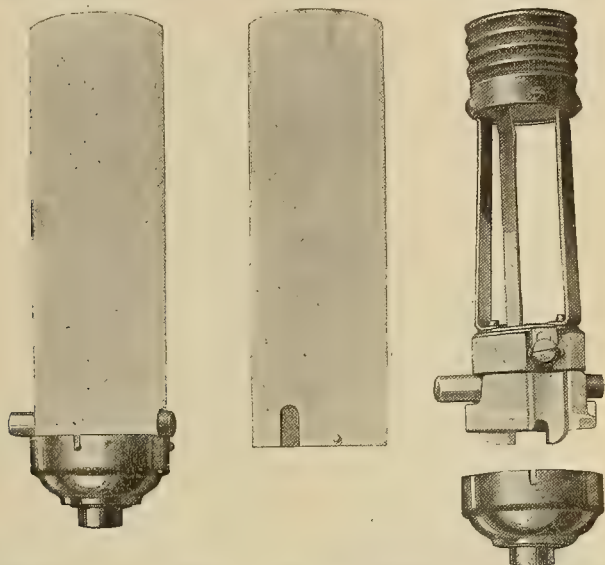
## LATEST IN EVERYTHING ELECTRICAL

(A new push socket of the candle length type described below is especially easy to handle since it has an improved cap catch which makes it possible to attach the socket shell and switch off by a slight turn of the fiber candle shell. The new electric rivet heater introduced here can heat rivets faster than the operator can handle them. Tests have proved it much more efficient and economical than older methods of rivet heating.—The Editor.)

### CANDLE LENGTH SOCKET WITH IMPROVED CAP

A new push socket of the candle length type, which is being manufactured by The Cutler-Hammer Manufacturing Company of Milwaukee, Wis., differs from the former Cutler-Hammer Candle Length Socket in that it has an improved cap catch which enables the socket shell and switch to be attached to the cap by a slight turn of the fiber candle shell. An opposite turn or twist detaches the candle, socket and switch so that they can be lifted from the cap.

The new cap consists of the ordinary socket cap with a concentric sleeve over the enlarged end. Three notches in the sleeve coincide with similar notches in the cap proper, and are spaced to receive three short stubs projecting radially



The Candle Length Socket on the left is formed by inserting the socket shell and switch mounting into the fibre candle, and giving the latter a slight turn after it is set into the cap.

at the bottom of the fiber candle. When the fiber candle is inserted in the cap and given a slight turn, the sleeve moves with it, and the holding stubs of the candle follow horizontal slits in the stationary cap. The candle is therefore locked and held at three distinct points. This insures firmness and stability to the assembled sockets, whereas when the candle is held at fewer than three points any disturbance such as jarring or handling sometimes deflects it from its natural upright position. The standard quick make-and-break mechanism used in all Cutler-Hammer Push Sockets and Switches is employed.

This Candle Length Socket is likened to a standard Cutler-Hammer Socket, the screw shell of which has been pulled away from the body and connected to the latter by three metal strips. The socket will hold any standard size lamp.

### NEW ELECTRIC RIVET HEATER

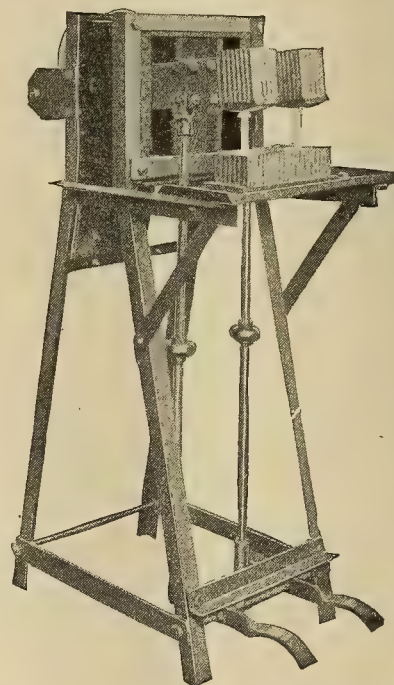
The coke forge and the oil-burning furnace for rivet heating promise to become things of the past now that the General Electric Company has just placed on the market a new electric rivet heater, which in tests has proved much more efficient and economical than the old methods.

This new device, which is manufactured in the Schenectady plant, will mean a great saving of material and time and will do much to improve the sanitary conditions for the worker.

A first glance at this machine gives one the impression of a portrait camera on a tripod. The rivets are placed between two electrodes. This completes the circuit and they begin to heat, much the same as coils in an electric toaster. The electrodes holding the rivets can be operated separately by the use of foot pedals, thus the man operating the machine can take out a heated rivet from one side, replace it with another to be heated and then alternate to the other side for his next heated rivet. A switch on the back gives the variations of current to be needed in heating rivets of different sizes.

This machine is capable of heating 800 rivets per hour, believed to be the maximum number an operator can handle. It is said this number can be increased but at present there is no demand for a quicker heating.

The outstanding advantages of this electric device are: No waste time in starting production; heating of the rivets from the inside, giving uniformity of heat which produces a minimum of scale on the rivet; wastage of rivets is reduced to a minimum, since the danger of them burning up as they do in the forge and furnace is practically eliminated; power is used only when the rivets are being heated, a big expense saver; heater is air cooled and portable, the wheels being mounted on the base when desired. In using the electric rivet heater there is no smoke, ashes, or contaminating gases and there is a minimum of heat radiation. Several large industrial plants have become interested in the installation



Eight hundred rivets per hour can be heated on this machine which has already been adopted by several large industrial plants. The rivets are placed between two electrodes so that the circuit is completed and the rivets heat much the same as the coils in an electric toaster.



of this machine, as in the bulkhead of shops, the heat and contaminating gases arising from gas and coke heaters has become so great that the workers have to make frequent trips to the outdoor air. The electric heaters eliminate this and consequently add to the production.

Among large plants interested in this machine are the Ford Automobile Company and the American Locomotive Company. The first machine perfected for commercial use was placed in the Schenectady works of the American Locomotive Company about five months ago and is still in operation and giving perfect results.

## Book and Bulletins

### Company Bulletin

The Pacific Power and Light Company Bulletin which was discontinued during the war is again being published. This magazine is published monthly in the interest of the company's employees. George L. Myers, who is now assistant to the president of the Pacific Light and Power Company, is acting as its editor. In addition to editorials, personal notices and meeting notices there are Sales, Accounting, Engineering and Legal departments as well as interesting "Shock Absorbers," a well filled "Question Box," a section for Officers and Officials, and a convenient so-called Service List, which gives all cities in which the company operates, their population and the type of service supplied.

### Mineral Resources

The report of the United States Geological Survey on the mineral resources of the United States for 1916 has been delayed because of urgent war work. This report marks the thirty-fifth year for which such reports have been published. The chapters for 1916 have been published in separate form as fast as completed, often months in advance of this regular report. The first volume, a book of some eight hundred and seventy pages, deals with the metal resources, and Volume II is a report of the non-metal mineral resources of this country. Many valuable charts and tables appear throughout.

### Engineering

California Irrigation District Laws, Bulletin No. 6, has been compiled for the Department of Engineering by the California State Library. An account is given of the organization of irrigation districts in California, which has resulted from the Wright Irrigation District Act as revised in 1897 and now designated as the "California Irrigation District Act." The defects of the original Wright Act are given as well as the improvements made through revision and re-enactment. The California Irrigation District Act as it now stands is defined as, "An Act to provide for the organization and government of irrigation districts, and to provide for the acquisition and construction thereby of works for the irrigation of the lands embraced within such districts, and also to provide for the distribution of water for irrigation purposes." This Act is given in full here as well as an account of supplementary legislation on the subject.

An extract from the administrative report of Franklin K. Lane, Secretary of the Interior, has been reprinted as Bulletin 705 of the United States Geological Survey. This is called "Conservation Through Engineering," and goes to show that the largest conservation for the future can come only through the wisest engineering of the present.

In the November issue of "Transactions of the Illum-

inating Engineering Society," both the report of the committee on progress and an article entitled "Home Lighting—How to Make It Comfortable and Effective," are of unusual interest. The society's regular publication office is located in Eaton, Pennsylvania.

The December "Engineering Education," published by the Society for the Promotion of Engineering Education, contains, among other interesting articles, one by C. F. Hirshfeld, "Present Status of Research in the Industrial Life of This Country," and a worth-while discussion of engineering education by H. P. Boardman, professor of civil engineering at the University of Nevada.

### Report of Smithsonian Institution

The latest annual report of the Board of Regents of the Smithsonian Institution has recently come from the Government printing office. This report shows the operations, expenditures, and condition of the institution for the year ending June 30, 1917. It is a 674 page book including a full description and cuts of the most important undertakings of the Institution. Space is given to such interesting subjects as, Projectiles Containing Explosives, Gold and Silver Deposits in North and South America, Notes on the Early History of the Pecan in America, and The Sea as a Conservator of Wastes and a Reservoir of Food.

### Industrial Publications

The Tracy Engineering Company of San Francisco has published a booklet, "Dry Steam," which sets forth the causes of wet steam from boilers, and gives a complete, well illustrated description of the Tracy Steam Purifier which insures dry and clean steam before it leaves the boiler. A significant table which is given shows the influence of moisture on the performance of superheaters. The booklet also includes the result of a typical test made of the Tracy Steam Purifier as well as a partial list of installations of marine type purifiers.

Bulletin No. 49 of the Wellman-Seaver-Morgan Company is entitled, W-S-M Car Dumpers. Opposite each view of various stationary and moving car dumpers in operation is a blue print of the machine labeled so as to show the exact dimensions and processes of operation. The publishers announce their desire to distribute this attractive bulletin, upon request sent to their offices in Cleveland.

A new small folder describing Electric Space Heaters, known as Publication No. 494, has been published by the Cutler-Hammer Manufacturing Company. This folder is a six-page envelope size, supplied to various electric supply houses who now are disposing of this line of industrial heating apparatus. One of the significant illustrations shows the Space Heater with a two-foot rule held alongside to further illustrate the fact that this heater is two feet long. It is referred to in the folder as "Two Feet of Electrical Heat."

A large broadside has also been printed reproducing many of the current advertisements on the Cutler-Hammer Electric Space Heater and including in it a list of publications in which the advertisements are appearing, with the dates chronologically arranged. The fields covered by the various publications are explained briefly.

### Transactions and Reports

The Tenth Annual Report of the Board of Public Utilities of the City of Los Angeles gives statistics and activities of all public utilities in Los Angeles during the period July 1, 1918, to June 30, 1919.

Volume 14 of the Transactions of the Illuminating Engineering Society, reviewing the organization's affairs up to October, 1919, and printing three papers, has recently been issued by the society.



## NEW ELECTRICAL DEVELOPMENT

(Plans for selling Skagit power project bonds and an announcement of power line extension are among items from the Northwest, while extensive dam construction and arrangements for the establishment of a large radio factory are included in Pacific Central notes. The Southwest and Intermountain districts report power plant construction and power rate adjustments among other noteworthy items.—The Editor.)

### THE PACIFIC NORTHWEST

**OROVILLE, WASH.**—The Okanogan Valley Company will be extended from Tonasket to Oroville, thus closing the gap of seventeen miles.

**OMAK, WASH.**—Local reclamation officials have recently made surveys for the power plant and transmission lines for the Robinson flat power plant.

**VANCOUVER, WASH.**—Forty permanent arches are to be constructed in the business district to be studded with electric lights for street illumination.

**ROSEBURG, ORE.**—At the May election the people of Roseburg will vote on issuing bonds in the sum of \$500,000 for construction of a power plant and a water system.

**SEATTLE, WASH.**—The sale of \$1,000,000 city light and power bonds, without the intervention of bond brokerage firms, is being made direct to the public, the sale being conducted from April 1 to May 15.

**WOODLAND, WASH.**—The North Coast Power Company, operating a network of power lines in southwestern Washington, will rebuild transmission lines between Kalama and Woodland. The cost is estimated at twenty thousand dollars.

**OLYMPIA, WASH.**—The state capitol commission will receive bids up to April 30th for the construction of a power house chimney and a tunnel for carrying steam lines. The estimated cost is two hundred and seventy thousand dollars.

**EVERETT, WASH.**—The tentative district for the new lighting system of the city includes about 14½ miles with poles 200 feet apart on each side of the street, but placed alternately so that there will be a light on the street every 100 feet.

**SEATTLE, WASH.**—The Pacific Northwest Traction Company is placing a special car on the run between Seattle and Everett with Westinghouse Electric & Manufacturing Company equipment. The car will have helical gear and will be fitted with an observation platform.

**SEATTLE, WASH.**—Mayor Hugh M. Caldwell has made public a financial statement covering operation of the municipal street railway system for the year ending December 31, 1919, which showed a net operating loss of \$517,173.79, including an allowance of \$499,173.39 for depreciation.

**SEATTLE, WASH.**—Westinghouse Electric & Manufacturing Company has sold to the Pacific Northwest Traction Company a 500-kw. rotary automatic sub-station complete with all automatic devices. The cost is approximately \$50,000. The station is to be installed on the Seattle-Everett interurban line.

**SEATTLE, WASH.**—An ordinance was recently drawn by corporation counsel appropriating \$300,000 for preliminary development of the Skagit river light and power project, the money to be taken from the \$1,500,000 paid on the first bond issue and used in purchasing a right-of-way for the railroad line from Rockport to the Skagit power site, and for the first construction work on the line.

**SPOKANE, WASH.**—The Washington Water Power Company is soon to construct a line from its Long Lake plant to Chewelah and supply the Stevens County Light & Power Company with all the additional power required, providing a part of the necessary financial expendi-

ture, which would amount to over \$100,000, is advanced by the parties interested. The magnesia industries have guaranteed \$70,000.

**SEATTLE, WASH.**—Sealed proposals will be received by W. D. Freeman, purchasing agent, city of Seattle, up to April 21st, for furnishing roof trusses for the third unit of the city auxiliary light and power plant at Eastlake avenue and Nelson Place. Each bid must be accompanied by a certified check payable to the order of the city comptroller for not less than five per cent of the total amount bid.

**SEATTLE, WASH.**—About July 1, from \$750,000 to \$1,000,000 Skagit power project bonds will be sold to finance work during the summer. Work contemplated for the present year includes construction of a railroad from Rockport (already let to Grant, Smith & Company, local, at \$466,000), to the site of the power house; building of a sawmill, and the construction of a power plant. It is hoped to have this work completed by fall when bids will be asked for the first unit of 36,000 kilowatts.

**PORTLAND, ORE.**—A composite report from four large power companies, three large jobbing houses and two large manufacturing representatives, has been drawn up. Manufacturers, jobbers and one power company report collections appreciably slower while others report no change. There seems to be a tendency to appreciably restrict credit at the present time. Those reporting no change in credit policy admit that they anticipated present conditions and began credit restrictions which are still in effect.

**ASTORIA, ORE.**—Cheaper electric power for manufacturing plants is a problem that the Port of Astoria commission will attempt to solve. This matter came up at a recent meeting of the commission, when H. W. Goodenough presented a letter from an official of the Beaver Board Company, indicating that the company will establish a plant here if it can secure about 6000 horsepower of electrical energy at a reasonable rate. Mr. Goodenough declared the proposed plant would employ about 300 skilled men and its first unit would provide approximately 7 tons of finished product for shipment daily.

### THE PACIFIC CENTRAL DISTRICT

**REDDING, CAL.**—The gates of the Messelbeck dam of the Happy Valley irrigation district have been shut down and the reservoir that will hold 5,000 acre feet of water is filling up.

**TRANQUILLITY, CAL.**—Mr. Sullivan, who has the contract for putting in the new electrical equipment for the irrigation district, has been here from San Francisco and expects to return soon with 25 men and five carloads of material ready to commence work.

**SALINAS, CAL.**—Surveys for an auxiliary power line between the Lagunitas and Soledad are being made by a corps of Coast Valleys gas and electric men. The estimated cost is in the neighborhood of \$100,000. Construction work, it is understood, will be commenced as soon as practicable.

**TAFT, CAL.**—The United Electric Company of Taft is given permission to issue \$25,000 aggregate par value of its capital stock, to certain persons in exchange for the assets and good will of an electrical supply business heretofore conducted by H. J. Anderson at Taft, under the name of United Electric Company of Taft.

**MODESTO, CAL.**—It is stated that the last link connecting all the main power companies of the state will be completed May 1st. This final link which connects the lines of the Pacific Gas & Electric Company and the San Joaquin Light & Power Corporation at a point north of Modesto will permit the operation of all the principal electric and power companies of the state as one unit.

**SAN FRANCISCO, CAL.**—The \$5,000,000 recently set aside for the construction of the Hetch-Hetchy dam by the Utah Construction Company cannot be used for financing other parts of the work, in the opinion of City Attorney Lull. It was proposed that some of this money be used to tide over the period until the Board of Supervisors could dispose of more bonds for the continuance of other parts of the work.

**MARYSVILLE, CAL.**—The Honcut-Yuba Irrigation District, covering about 10,000 acres between the Halwood district and the Butte county line, has an option, until August 1 next, upon 2,000 acres of land in Oregon House valley, which if taken will make a typical reservoir site for the storage of the waters of Dry Creek in the wet season. The Pacific Gas & Electric Company at one time looked with favor on the same property.

**NEWCASTLE, CAL.**—The Pacific Gas & Electric Company has commenced extensive construction work between Newcastle and Auburn. Two large camps have been established and more than fifty men are employed. The work is to consist of widening the pipe-line tunnel through Adams Hill and extending the line into Long Valley and the Rattlesnake district. In all, the expenditures of the next few months are expected to aggregate more than \$200,000.

**SAN FRANCISCO, CAL.**—The Railroad Commission has authorized the San Joaquin Light & Power Corporation to increase its rates for electricity by an average of 11 per cent over the existing charges for the year 1920. The order is effective for all service rendered on and after April 1. The commission also authorizes an increase in the rates of the Mt. Whitney Power & Electric Company equal to the increase granted the San Joaquin Light & Power Corporation.

**COALINGA, CAL.**—At a meeting of the city trustees R. C. Baker, formerly president of the Coalinga Gas and Power Company, which was taken over by the city seven months ago, appeared before the board in behalf of the stockholders of the company and demanded an explanation regarding the city's failure to make the regular payment due last January. His demand included a request that the trustees state some definite time when the payment could be made, if not at present.

**SAN FRANCISCO, CAL.**—Arrangements have been perfected for the establishment here of one of the largest and most thoroughly equipped factories in the West for the manufacture and perfecting of all sorts of radio and wireless equipment, with the completion of negotiations by the National Radio Company for the purchase of a site at Folsom, Shotwell and Twentieth streets. With the purchase of the property completed, the old buildings now occupying the site will be razed and ground broken immediately for the commencement of work on the new building.



**SAN FRANCISCO, CAL.**—Lars S. Jorgensen of this city has applied to the State Water Commission for 350 cubic feet per second from Middle Fork, Feather river, in Plumas and Butte counties, for power purposes. The amount of water to be stored is 60,000 acre feet. Diversion works consist of a canal 36 miles long and a concrete dam—with wasteway over the dam—100 feet high, 200 feet long on top and 100 feet long at bottom. Estimated cost, \$6,000,000. Also the same applicant asked for 450 cubic feet per second from Middle Fork, Feather river, for power purposes. The amount of water to be developed is 58,800 t.h.p. Amount of water to be stored, 40,000 acre feet. Diversion is to be by canal 17 miles long and concrete arch dam, wasteway over dam, 129 feet high, 250 feet long on top and 100 feet long at bottom. Estimated cost, \$4,500,000.

### THE PACIFIC SOUTHWEST

**LOS ANGELES, CAL.**—The Los Angeles Railway Company will extend its 48th Street line from Second to Sixth Avenue. The work is to be started soon.

**LOS ANGELES, CAL.**—Permission to construct three spur tracks at the grade across the Santa Monica Boulevard has been asked of the State Railroad Commission by the Pacific Electric Railway Company.

**SAN BERNARDINO, CAL.**—Sealed bids have been received for the construction of cement concrete lighting posts, wires, conduits, lamps and appliances, to be constructed along both sides of Third Street between Arrowhead and Mt. Vernon Streets.

**REDLANDS, CAL.**—Plans were made by the Redlands & Yucaipa Land Company for the extension of the water system on Dunlap ranch, the improvements to cost \$100,000. Plans provide for three reservoirs. The extension planned for will take care of 2,000 acres.

**SAFFORD, ARIZ.**—H. F. Olmsted has been employed by the Water Users' Association to do surveying, making plans, estimates and specifications for a dam to be located one mile above the Brown Dam. The erection of a power plant which will cost \$1,500,000 is also contemplated.

**LOS ANGELES, CAL.**—The Board of Supervisors has adopted a resolution, which will be sent to the state legislature, asking for an appropriation of \$100,000 to assist hydrographic survey work and obtain data on rainfall and annual runoff of streams in the mountain regions of Southern California. There is at present an appropriation of \$5,000, but it is inadequate to provide information on which to base plans for irrigation and flood control projects for the valuable agricultural sections.

**EL CENTRO, CAL.**—The question as to how great is the bonding capacity of the Imperial Irrigation District has been submitted to the State Bond Commissioner, and upon the answer will depend the extent of the construction of the All American Canal, which will be submitted to voters at a special election. The District Board favors \$30,000,000 for the purpose of building the canal from Laguna Dam, in the Colorado river, to Imperial Valley, but may be limited to the first leg from Laguna to Hanlon Heading.

**LOS ANGELES, CAL.**—Sufficient power to light every home, every train, and turn the wheels of every factory west of the Rocky Mountains can be developed in the 1,500,000 acres of the Colorado basin, according to estimates made at a conference of representatives of irrigable lands in the basin south of the Grand Canyon, held in Los Angeles. A definite plan for placing the entire development plan before Congress has been worked out and a movement started to bring about cooperation of the Government.

**RIVERSIDE, CAL.**—The Southern Sierras Power Company of this city has for some time past been transmitting a high tension electric current for a distance of 517 miles, doing it

successfully. This line runs from the company's plant in California to Yuma, Arizona. The current is ordinarily brought 239 miles from Yuma to San Bernardino at 87,000 volts and stepped down to 55,000 volts and sent on the remainder of the distance. The flexibility of the system, however, is such that when a transformer recently burned out in San Bernardino the current was sent the full 517 miles at 55,000 volts during the time of repairing.

**PHOENIX, ARIZ.**—Plans for a steam generated electric power plant are being completed by Louis Melzer, well known Phoenix business man, and his associates, to furnish electricity for Casa Grande and the surrounding valley. The new company has already obtained a permit from the corporation commission for the big plant which is designed to be ready by July 1st to supply electric light and power to a district half the size of the Salt River Valley project. The town of Casa Grande is now being inadequately served with electricity from a small municipal generating plant, while the ranchers of the 120,000 acre project are forced to depend upon fuel oil for pumping and other purposes for which electricity can be substituted to great advantage.

### THE INTER-MOUNTAIN DISTRICT

**RIGBY, IDA.**—The city of Rigby is contemplating installing a White Way street lighting system in the near future.

**MONTPELIER, IDAHO.**—Farmers of Dingle, Bern and Lamark, towns in Bear Lake county, have asked the Utah Power & Light Company to build lines from this city to give electric service to their communities.

**IDAHO FALLS, IDA.**—The new unit at the city's electric plant has just been put into service. This machine will generate 600 kw. and gives the plant a total capacity of 1600 kw. The new machine has a capacity two-thirds as large as that of the entire plant previous to its installation.

**POCATELLO, IDAHO.**—Formal permission for the Idaho Power Company to give service to residents of North Pocatello, Bannock county, has been given the company by the public utilities commission of Idaho. The power company has hitherto been authorized to serve Pocatello and other adjacent municipalities.

**BRIGHAM CITY, UTAH.**—To allow the Brigham City electric light plant to increase its capacity to meet the growing requirements of the city, application has been made to the state engineer by Mayor J. W. Peters to divert thirty second feet of water which the city now uses to generate electric energy from a point further up Box Elder Creek.

**SALT LAKE CITY, UTAH.**—The Utah Power & Light Company has filed with the public utilities commission of Utah petition for a certificate of convenience and necessity to extend its lines in Juab county, in accordance with a franchise already granted to it by the county commissioners of said county. The franchise runs for fifty years from March 1st, 1920.

**SALT LAKE CITY, UTAH.**—The Provo Reservoir Company will soon have a pumping plant located approximately 200 yards south of the dam across the Jordan river at the Narrows, which is about twelve miles south of Salt Lake City. Their initial electrical installation will be about 400 horsepower, with an additional 800 horsepower unit in 1921. They expect eventually to use 3600 horsepower in their pumping operations.

**POCATELLO, IDAHO.**—The largest irrigation district in the state of Idaho is asked for in a petition filed recently before the county commissioners of Butte county by Edward M. Rowe and others. It is to be called the Big Lost River irrigation district, and includes more than 75,000 acres of land lying in Custer and Butte counties, chiefly in Butte county. It is expected that considerable pumping will be done by means of electric power.

**SALT LAKE CITY, UTAH.**—Hearing before the Utah public utilities commission of the petition of the Utah Power & Light Company to increase its power rates, set for March 30th, has been continued by the commission until April 26th; upon motion of the companies protesting.

**LOGAN, UTAH.**—Work on the new White Way street lighting system to be constructed in Logan has just begun. This street lighting system is to cover nine blocks in the business district of Logan, three blocks of which will have double standards and six blocks single standards, with eight poles to the block. Each lamp will be 600 watts. The ornamental design of the standards will very similar to that installed in Salt Lake City. This installation is being made by the city of Logan, and the system will be operated in connection with the city electric light plant.

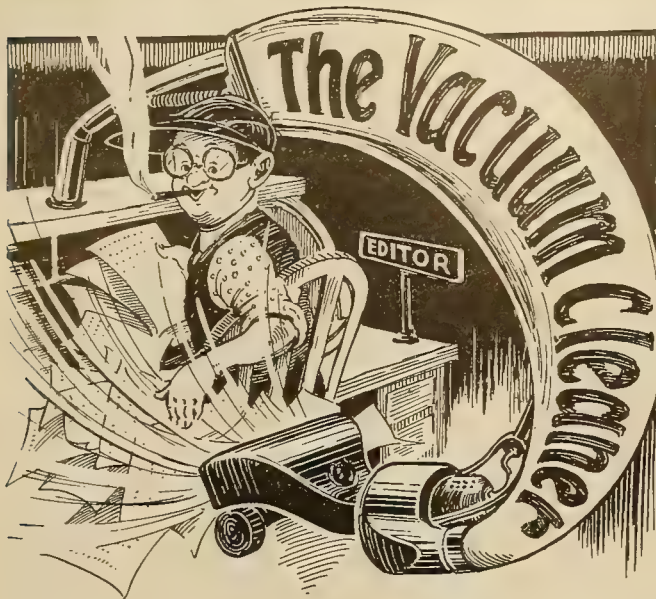
**MONTPELIER, IDA.**—The farmers of Bern and vicinity, in Bear Lake County, are contemplating the installation of a pumping plant there which will be able to furnish water to irrigate approximately 5000 acres of land. The promoters plan to take the water from the old outlet from Bear Lake, and by means of two lifts bring the water within the reach of 5000 acres of choice farming land.

The improvements, with others contemplated in Bear Lake County, will eventually make this county one of the richest in the state of Idaho. Much development of the natural resources is needed, and the people of the county are awakening to the need of expansion.

**DENVER, COLO.**—The Western Light and Power Company, which is operated by the Doherty interests, reports a large expansion of its Colorado business. It has added 300 kw. at the Evans mine, in the Frederick coal field of the Lafayette district, displacing steam equipment formerly in use. As the steam equipment of the coal mines in this district wears out, it is being replaced with electric equipment with power supplied by the Western Light and Power Company. All the new mines are being equipped electrically, and the load of the power company is being built up so fast that it has necessitated the construction of a new sub-station. The new buildings to cost \$1,000,000 at the University of Colorado will be furnished electricity by the company, and the company expects good increases in new business in Loveland, where the building now going on is the largest in the history of the town. The company will supply electricity to the Fort Collins Pressed Brick and Tile Company, situated between Loveland and Fort Collins; will furnish light to a new theater now in course of construction at Fort Collins, and will supply 100 hp. to operate the ice plant of the Capital Coal, Ice and Storage Company.

**SALT LAKE CITY, UTAH.**—At the recent hearing at Salt Lake City before the Public Utilities Commission of Utah on the application of the Utah Power & Light Company for permission to increase its power rates, consideration was given to a report written by Louis Elliott, of New York City, on the cost of construction and operation of a proposed steam-electric plant on Utah Lake. Mr. Elliott has charge of the steam-electric department as engineer for the Electric Bond & Share Company of New York City. His schedules, or estimates on construction, operation and maintenance costs for a plant of 40,000 kilowatts capacity were presented in view of the fact that the Utah Power & Light Company is contemplating resorting to steam power for generating purposes. This recourse is said to be forced upon the company by reason of the fact that practically all of the available water power in its territory is already converted to use. It is argued that if the company is compelled to erect steam plants, as seems at this time to be the immediate prospect, operating costs will be materially advanced, and an increase in rates will become absolutely necessary.





Economy is a dangerous virtue in the hands of an Irishman. A superintendent once called a meeting of section foremen to instruct them how to save money.

"Now, if you are driving a spike," he said, "and you hit it a glancing blow and it flies into the weeds, instead of picking up another one, go out and get the one in the weeds."

The superintendent was going over one of the sections some time later and found a spike by the fence. He called the section foreman to his office and recalled how he had been instructed about saving money on little things, and then said: "Mr. Murphy, I found this spike on your section. Now, what have you got to say for yourself?"

"You found it, did ye?" said Mr. Murphy. "Now, you know that me and seven of the men looked two whole days for that spike and never did find it."

\* \* \*

An aftermath of the income tax epidemic is reproduced herewith. It will doubtless strike a responsive chord in the hearts of those harrassed mortals who have burned the midnight oil trying to figure out just how much the government thinks they have earned in twelve months.

First take your home,  
Add your wife's income,  
Divide by your eldest son's age,  
Add your telephone number,  
Subtract your auto license number,  
Then add your electric light bill,  
Divide by number of kilowatts,  
Multiply by your father's age,  
Add number of gold fillings in teeth,  
Add your house number,  
Subtract wife's age (approximate),  
Divide by the number of aunts you have,  
Add the number of your uncles,  
Subtract number of daughters,  
Multiply by the number of times  
You have gone up in an airplane,  
Subtract your best golf score,  
Add a pinch of salt  
And then go out and  
Borrow the money and pay the tax.

\* \* \*

A little learning is a dangerous thing where common sense would do just as well. The following story is told of Mr. Edison. One summer he took into his laboratory a young man who had just graduated from a scientific school with very high honors. He was to aid in making certain experiments.

One day Mr. Edison asked him to figure out at once the cubical contents of an incandescent lamp bulb which he handed him. Mr. Edison needed this information, he said, for an experiment. The young man went to work with slide-rule,

instruments, logarithm tables and that various assorted knowledge he had stored up in his cranium in study. He worked all day and he worked all night, and after he had verified it three ways he took the figures to Mr. Edison in the morning.

But Thomas Edison looked at the calculations and he shook his head. "Are you sure of that?" he asked. "It doesn't look just right to me." "I'm certain of it," said the youth. "Well, let's do it over," said Mr. Edison, and lightly breaking off the tip of the lamp he filled the bulb with water, poured it out again into a graduated measure and had the answer, while the young man stood there speechless..

\* \* \*

Advertising for future business is one of the cornerstones of success, according to most modern business writers. One of them says that a man who does not advertise is like a young fellow winking at his girl in the dark. He knows what he is doing but the girl doesn't.

A story is told of a Colorado evangelist who painted on a big flat-faced rock by a railway line the question:

"What will you do when you die?"

An up-to-the-minute advertising man came along shortly afterwards and painted underneath:

"Use Delta Oil; good for burns."

\* \* \*

It takes an artist to make out a really convincing bill. An old church in Belgium once decided to repaint its properties and employed an artist to retouch a large painting. The committee in charge refused payment of his bill unless the details were specified, whereupon he presented items as follows:

To correcting the Ten Commandments.....	5.12
Embellishing Pontius Pilate and putting new ribbon on his bonnet .....	3.02
Putting a new tail on the rooster of St. Peter and mending his comb .....	2.30
Repluming and gilding left wing of guardian angel.....	5.18
Washing the servant of the high priest and putting carmine on his cheeks.....	5.02
Renewing Heaven, adjusting the stars and cleaning up the moon .....	7.14
Touching up purgatory and restoring lost souls.....	5.08
Brightening up the flames of hell, putting new tail on the devil, mending his left hoof and doing several odd jobs for the damned.....	7.17
Rebordering the robe of Herod and adjusting his wig .....	4.00
Taking spots off the son of Tobias.....	10.30
Beautifying Adam's lost rib.....	5.88
Enlarging the head of Goliath and extending Saul's leg .....	6.13
Decorating Noah's ark, putting a head on Shem and cutting Ham's hair.....	4.31

\* \* \*



These attractive waitresses were a feature at the recent luncheon of the Short Circuit Club, of the Los Angeles Edison Company. The names of the young ladies from left to right are as follows: Bishop, Dull, Hinson, Morris, Rush, Harty and Brown.



# JOURNAL OF ELECTRICITY

VOL. 44 NO. 9

SAN FRANCISCO, MAY 1, 1920

PER COPY, 25 CENTS



# Thor

## Made Right—Sold Right

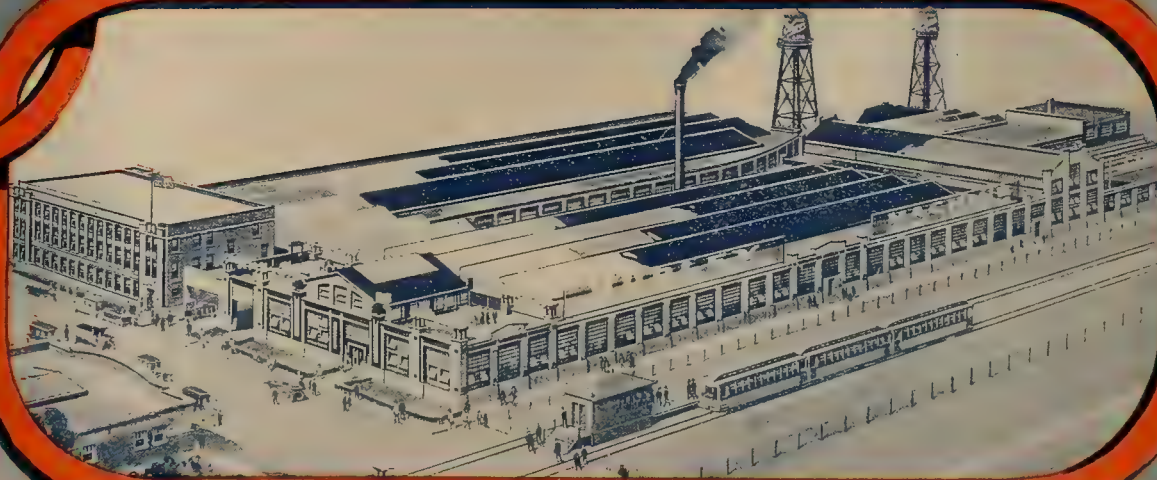
In the lead for fourteen years and still far ahead. That is the best evidence of Thor quality and popularity, and positive proof that the Hurley-Jobber-Dealer Co-operative Sales Plan brings the desired results.

**HURLEY MACHINE CO.**  
CHICAGO NEW YORK TORONTO

COAST DISTRIBUTORS

**PACIFIC STATES  
ELECTRIC CO.**

San Francisco Portland  
Seattle



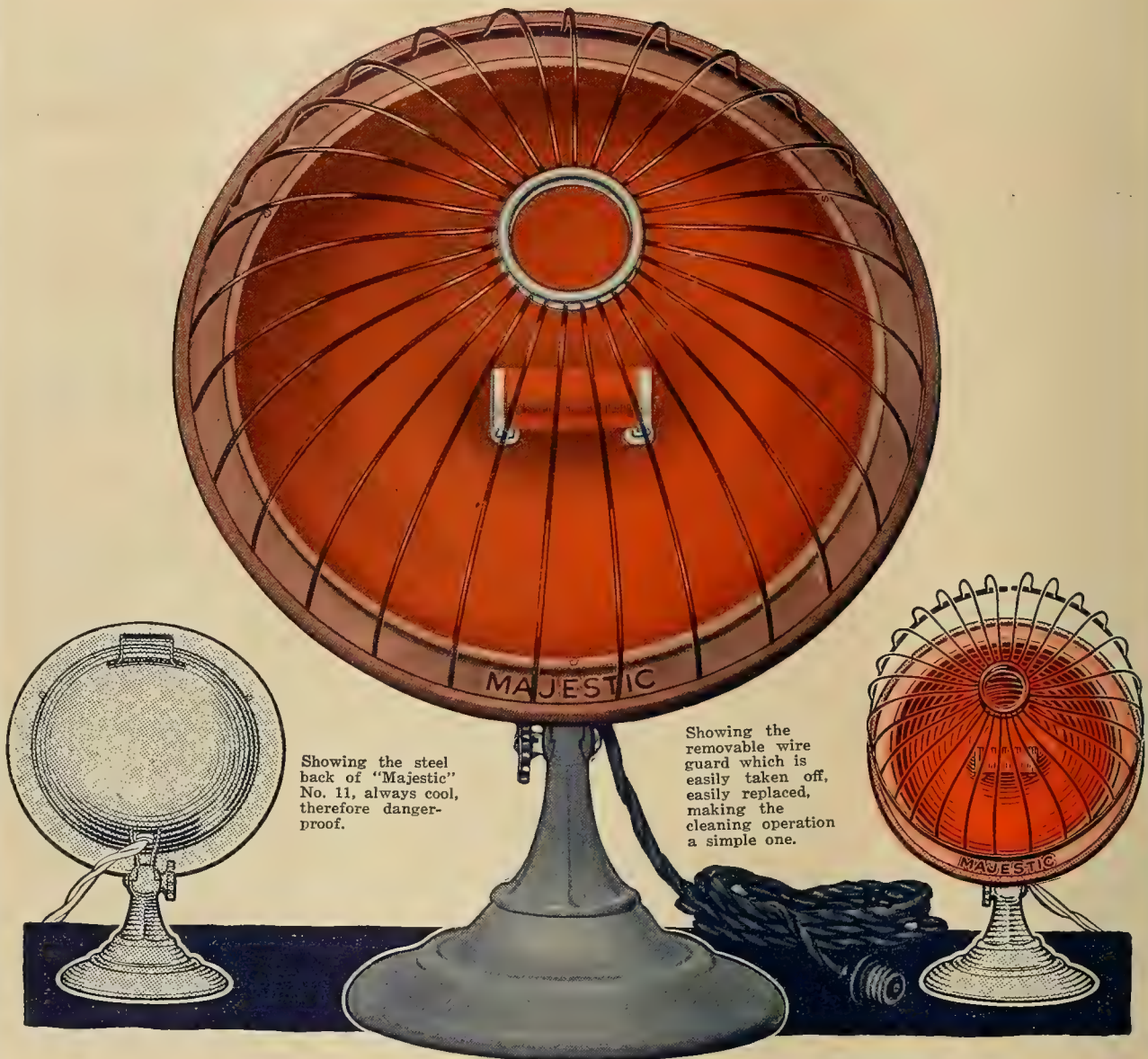


A New Addition to the "MAJESTIC" Line

# "MAJESTIC" No. 11

*A Sure Winner*

A chill-killer, a glow-bringer, a comfort-maker



Showing the steel back of "Majestic" No. 11, always cool, therefore danger-proof.

Showing the removable wire guard which is easily taken off, easily replaced, making the cleaning operation a simple one.

## "MAJESTIC" No. 11 — The Heater That Defeats Winter

### Dimensions

Height .....	19¼ inches
Diameter .....	14½ inches
Weight .....	7½ lbs.
Shipping weight .....	10½ lbs.

### Equipment

8-foot heater cord with separable attachment plug. Heating element guaranteed for one year. Reflector pure copper burnished.

There are, besides "Majestic" No. 11, six other styles of "Majestic" portable heaters and three stationary, or insert, types

## "MAJESTIC" ELECTRIC DEVELOPMENT CO.

Manufacturers and Patentees

KANSAS CITY

SAN FRANCISCO

PHILADELPHIA

"MAJESTIC" Electric Heaters——Best in Creation for Heat Radiation



# JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

VOLUME 44

SAN FRANCISCO, MAY 1, 1920

NUMBER 9

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## THE MODERN EL CAMINO REAL

**A** VAST double system of highways extending through California in parallel column a thousand miles in length from the Mexican border on the south to the Oregon state line on the north, constructed at a cost of one hundred million dollars, constitutes the modern El Camino Real or Royal Highway, which breathes the traditions of the early Mission life in California. The view is a part of the ancient El Camino Real founded by the early Spanish fathers but now made over into the modern California Highway. Along this stretch of road for hundreds of miles north and south are located contractor-dealer stores which today, under the invigorating influence of the California Electrical Cooperative Campaign, are making history and tradition for the electrical industry in the West and, as a model after which to pattern, for the industry as a whole throughout the nation.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, MAY 1, 1920

Number 9

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## The Electrical Industry and the Jobbers Convention

**T**HIS is the year of years for conventions in the West, but to our industry it has an unusual message of cheer and inspiration. The first of three great national conventions for the month of May is to convene at Del Monte, California, May 11th to 14th, 1920. Nine years have come and gone since the Electrical Supply Jobbers' Association held its convention in the West. These nine years have seen tremendous changes, vast forces at work, and new and interesting developments in the application of electrical energy; but beyond all physical attainment, engineering design, or achievements in installation, wonderful as these have been, the progress of the West in the merchandising of electrical ware has been unsurpassed. It is, as a consequence, with unusual pride that we welcome to our midst these men, captains of industry in the merchandising of electrical products, and invite them to the great playground of the nation and to see what the modern ideals of cooperative effort in electrical lines have accomplished west of the Rockies.

A hundred years ago the old Spanish Fathers traversed this state along the royal highway, or, as they called it, El Camino Real. Today, with vast highways stretching for eight hundred miles from the north to the Mexican border on the south, these great highways studded with hamlets and villages enable one to see a display of contractor-dealer effort in the merchandising of electrical ware that is unique and unusual in its setting, and of high attainment in ethical development.

And so we welcome you to our midst, and trust that before you leave our borders you will make the effort to look into these new and interesting developments that prevail throughout the length and breadth of the West, and see for yourselves the high ideals of attainment that have been wrought in the field of electrical merchandising. And, while we know that from you we shall learn many a well-taught lesson based on your wide and extended business experience throughout the nation, yet we trust that in a measure it may be our privilege to leave with you a message that may be helpful and instructive when on the morrow you must return to your busy activities in far distant corners of the nation.

The traditions of California are so interlinked with that of the early mission life that El Camino Real, or the Royal Highway, is known and revered in all countries and lands where the early life of California is known and enjoyed. A hundred years ago as these Spanish Fathers journeyed up and down the length and breadth of California they saw a sight no fuller in vision and no more worthy of mention than that of the modern El Camino Real of California, winding its way over hills and vales for a thousand miles from north to south, a fine example of modern design and engineering skill.

The contractor-dealer stores that today line this modern El Camino Real are indeed progressive and interesting and it is with no small sense of pride that we exhibit elsewhere in this issue some of the modern adornments of El Camino Real throughout the length and breadth of California. And it is to be said that to the vision and ability of the Cooperative Campaign movement great credit is due for what has been done in this regard.

The importance of the motor truck and the automobile in the life of the West have brought back the roadways to their own and today the two great highways of California not only provide a convenience of social intercourse between communities, but much actual commerce is carried on over their length.

Following the variations in topography and interest which mark the sections of the state thus connected by El Camino Real, local centers have developed each with a character and life of its own. In most cases this is very closely bound up with the electrical industry both on the farm and in the home, thus offering a varied but uniformly receptive market for electrical ware.

As these pages are about to go to press, there seems to be every indication that the forthcoming convention of the Foreign Trade Club to meet at San Francisco, May 12th to 15th, will be an unquestioned success. There are many outstanding features that will make this a convention long to be remembered. The powerful bankers, influential manufacturers and commercial

### The Foreign Trade Convention



men who have already promised their attendance at this convention come from all ports, not only of the Pan-Pacific countries but from every quarter of the globe.

Among the subjects that will be discussed at the convention are those of shipping, port facilities, standardization of money, new industries, and the effect of the development of foreign trade intercourse to a more intensive degree upon Pacific Coast ports and internal development. Far exceeding all other questions of discussion, however, will be that of stabilizing foreign exchange. There is a crying need of the hour that something be done to correct the present disadvantage under which we labor. This country seems to be at present overstocked with gold, and foreign countries seem to have an inability to keep their exchange rate such as will put their citizens on a reasonable basis of commercial intercourse with America. If our foreign commerce is to thrive, we must have this problem settled once and for all, and placed upon a sound footing that will give neither advantage nor disadvantage to us. We seek the friendship and commercial intercourse with all nations of the world, and in the sincerity with which we believe in our wonderful possibilities for future growth in international relations, let us do all that is reasonably possible to bring about the stabilization of foreign exchange. It is believed that those who are in attendance at the forthcoming convention in San Francisco will be given an unusual opportunity to express themselves along these lines, that will unquestionably prove of great timely helpfulness.

All of the power companies, especially those in the West, are vitally interested in the development

**Automatic Generating Plants** of automatic station equipment which will tend to reduce the cost of operation by decreasing the labor charge. In this connection the article appearing in another part of this issue by C. H. Tallant, describing the new automatic generating plant of the Ontario Power Company, in Ontario, California, is of more than usual interest. This plant is the first of its character to be installed in the West and there has been only one other similar to this installed previously anywhere. This particular plant has been operating successfully for several months and the designers are to be congratulated that the first installation has operated successfully without numerous changes and rebuilding.

Of probably more importance than the installation of new automatically controlled generating plants is the problem of converting present manually controlled generating stations into automatic control. There are dozens of small synchronous generating plants in the West which could and should be converted to automatic operation. If this were done the excessive cost of operation would be reduced so that these plants could compare with the economy realized in the largest and most modern plants. It is interesting to note that the Southern California Edison Company is, at the present time, undertaking the conversion of a number of its small synchronous

generating plants from manual to automatic operation and the progress of this test will be watched with the greatest interest. The equipment necessary for this purpose is comparatively simple, providing good judgment is exercised in the solution of the problem after the fundamental requirements are known. At the present time a two-unit plant, in first-class operating condition, may be changed to automatic control at an expense of from one and a quarter to two times the annual saving in labor cost within the plant. This means a return of from 50 to 85 per cent on the investment.

The two articles by H. W. Crozier on Oil Pipe Line Transmission which appeared in the Journal of Electricity of January 1st, 1920, and February 1st, 1920, have attracted such wide attention that we take this occasion to call attention to an article appearing elsewhere in this issue of the Journal of Electricity on the same subject under the authorship of no less an authority than W. F. Durand, professor of mechanical engineering at Stanford University.

Mr. Crozier, as author of the two former articles mentioned, dealt in a very practical and helpful manner with various empirical formulas which prove readily applicable to the designing of pipe lines for the transmission of oil from the oil fields to the point of transportation either by steam or over rail. The growing uses of fuel oil and the necessity for the utmost economy in transportation, thus bringing about a reduction in the cost of the product, is a continually pressing problem, and, as a consequence, anything that can add to our present knowledge on this subject is both timely and of unusual value.

In the article in this issue by Professor Durand, the author finds that eight characteristics or factors enter fundamentally into any subject connected with the conveyance of liquid, or fluid, through pipe lines. Thus he finds that the viscosity of the liquid, the density of the liquid, the diameter of the pipe, the length of the pipe, the roughness of the pipe surface, the velocity of flow, the gravity constant, and the loss of head in feet as measured by the difference of pressure between the two ends of the pipe line, constitute the factors upon which the hydraulics of oil pipe lines must be based. The remarkable outcome of Professor Durand's investigation is the tabulation of formulas that may be used not only for oils but also for air and water, thus coordinating and correlating the present literature we have on this important subject.

The subject of viscosity of oil has long been one of a perplexing nature, and in this article Professor W. R. Eckart of Stanford University points out that the relation between viscosity and temperature when plotted on the double logarithmic scale shows a close approximation to a straight line, at least over the working range of temperature for which the liquid may be said to retain its identity. Using this relationship, Professor Durand has been enabled to compute certain fundamental constants that aid very materially in giving practical application to the for-



mulas he has derived. The procedure he has outlined undoubtedly will lead us to more accurate information than can possibly be brought about in the use of empirical formulas hitherto applied in oil pipe line design. The transmission of oil through pipes, not only over long distances, but also in the boiler rooms and from the storage tanks to the power house interior, involves problems which are daily becoming more pressing. It is believed, as a consequence, that the contribution of Professor Durand in this issue of the Journal of Electricity will add vastly to our present useful knowledge on this important question.

Among the most difficult locations in which to install and maintain electrical equipment, especially motors, is that of mines. In another part of this issue B. B. Beckett points out in considerable detail a number of the particular difficulties which appertain to motor installations in gold and silver mines. The general conclusions which may be drawn from his paper are that proper maintenance will almost entirely prevent shut-downs due to failure of electrical apparatus, but that there is yet considerable progress which may be made in the design and manufacture of electric motors for heavy duty and infrequent inspection.

Particular attention must be paid to the insulation which, in mine service, will be exposed to dampness and oil. The difficulty with the oil may, however, be partly eliminated by greater attention to the design of the bearings. The greatest attention should be given to this feature in order to prevent as far as possible the throwing of oil from the bearings.

The close relationship of electrical pumping to crop production makes the present crop situation of vital interest to the electrical industry throughout the West. Summed up briefly, the high prices that the crops yield due to unusual circumstances, particularly in those districts where electrical energy is available for pumping, make the year one of unusual promise for the state. The late rains in March have assured the usual crops and their normal harvest. In the fruit districts where electrical pumping is available the farmers have made use of winter irrigation by thoroughly permeating the ground with water throughout the winter months to an extent that assures safe and substantial crops this year, in spite of its rainfall shortage. Instances of this may be seen in the Lodi district of California where the famous Tokay table grape finds its home. Here the Tokay grape vineyards have been thoroughly irrigated time and again during the winter, and the summer and fall should find them well cared for so far as reasonable moisture supply is concerned. Up and down the delta lands, in the so-called Netherlands of California bordering the San Joaquin and Sacramento rivers, the produce situation is also favorable. Thus it is seen that while the year is one of unusual

#### **The Crop Outlook in the West**

shortage in rainfall and unusual shortage of power as a consequence, yet in spite of this the districts where hydroelectric energy has been available throughout the year will experience a minimum setback, and indeed in many instances will prove normal in production. As a consequence the unusual prices which are prevailing for forthcoming crops should make the year one of exceptional prosperity in California and the West.

Each day requests of finance, wherewith to meet the crying needs for development of power in the West, become more acute. The instance of the San Joaquin Light & Power Corporation, operating in Central California, is quite illustrative of the present situation. This company, which operates in one of the most flourishing agricultural districts of California, has during the past sixteen years developed a power distributing system, having for a total output some 84,000 horsepower. This is the work of sixteen constructive years; and yet, in one year, the year 1920, this company will have installed 45,000 additional horsepower on its Kerckhoff Plant, 9,000 horsepower on Kerckhoff Junior, 17,500 horsepower additional in steam electric at Bakersfield, and 17,500 in its new natural gas steam electric plant in the McKittrick oil fields, making in all a total additional horsepower of 89,000 more in one year—new installations of power representing a hundred per cent more power than was built up in the total sixteen years prior constructive work.

A survey of the power situation in California divulges the fact that there must enter into this state, within the next five years, a sum not less than \$250,000,000. The question then arises as to what is the best and most expeditious way in which this money may be secured. Would it not be a constructive plan for the various power companies to meet together informally, consult informally with the Railroad Commission and with other institutions of California, that might shed a helpful light on the situation, and to see whether a budget of total bonds required might be formulated, and a power deal put through on a group bond selling proposition? The idea is new, yet is vast in possibilities and well worthy of thoughtful consideration.

#### **A Group Selling Plan for Utility Bonds**

It is interesting to follow the many ramifications of an institution that is founded with the sole purpose of educational effort looking toward cooperation in an industry. With small beginnings in the West, this cooperative movement is now clarifying, purging and cleansing many channels of industry that in former days many questioned and hoped might be purged; but no one saw the means by which this might be accomplished.

#### **The Department Store and the Hardware Store**

Some of the latest possibilities of broadening cooperative effort in the West came about at the recent state gathering of the California Association of Electrical Contractors and Dealers in Stockton. Here the subject was brought up as to the status of



department stores and hardware stores in the handling of electrical ware insofar as the electrical industry is concerned. Men representing these various branches of industry and trade were present, and those who listened to the earnest discussion could not help but feel the inspiration and value to be derived by such gatherings as that held at Stockton.

There are many problems yet to be solved in the merchandising of electrical ware, but it is believed that the Stockton meeting has advanced the industry one peg further in the merchandising of electrical appliances and apparatus in the West.

There is no reason why the channels of trade should in any manner be ever obstructed. Indeed, one may as well try to stop the tides of the ocean as to obstruct the channels of trade.

The hope, then, for the entire situation is that ethical standards be continually raised and put into practical operation in everyday life. Thus the taking of the department store and the hardware store into conference in matters of this sort points the way to a united effort for the good of the electrical industry as a whole, along the lines of the broad-visioned activity that now prevails throughout the West.

In a recent issue of the Journal of Electricity attention was called to the low salary of the engineers and others of the office class of employes of the public service corporations of the West. The situation of the employes of many, if not all, of the federal government bureaus is probably still more critical, if such could be possible.

The adequate exercise of the many functions of the government and the economical expenditure of the vast sums involved depend upon the ability, efficiency and integrity of the scientists, engineers and other professional men in the executive branch of the government. Men of the type and ability to have and exercise such qualifications cannot be secured for the pay given the office boy or stenographer, nor can their services be retained even though they have the small satisfaction of knowing that their tenure of office is quite secure. This is forcefully brought out by the figures showing the turnover during recent months. With an average personnel of 473 in the technical staffs at Washington and Pittsburgh the period since 1916 has seen a total turnover of

1400; an average of 85 per cent, and a maximum of 145 per cent.

These are startling figures and they have a startling meaning: unless some radical change is made in the very near future a complete breakdown of the civil service structure is in sight. This will result in an appalling waste due to the lack of experienced employes which will far exceed the sums needed to put the service on a businesslike basis and compensate the workers for their services in proportion to the value returned.

The matter is now up to the Joint Commission on Reclassification of Salaries and the findings and recommendations of this body will be watched with interest.

The tremendous widening of the horizon of the engineer makes even more imperative than ever before the necessity that he be well versed in economics and in the power of the pen. It is interesting to note, too, in passing, that this same economic advance has very materially widened the market for engineering endeavor in the field of technical journalism. The consequence is that this field today is one of the brilliant opportunities of the future for the young engineer. In view of all this situation, it is rather surprising that in none of the great engineering institutions of the West is there to be found today either a school of technical journalism, a course in technical writing that may be really called such, nor a student paper devoted to the subject exclusively of engineering and technical writing. The University of California, with its ten thousand students enrolled and with its engineering department crowded to the limit, is woefully neglectful in this particular. An instance of what can be done in the way of real technical training is to be found among the agricultural students of the University of California, where a magazine is published known as the Journal of Agriculture. One needs but a few moments of observation of the pages of this magazine to see that it is brim full of life and activity and of wonderful service in formulating the vision of the young agricultural engineer. It is certainly to be hoped that the faculties of our Western engineering colleges and universities will give some thought to bettering this unfortunate situation at the present time.

## MAY 15 --- SPECIAL CONVENTION ISSUE

A complete survey of the water power resources and developments of the states west of the Rockies





THE ALAMEDA — A STRETCH OF EL CAMINO REAL AS IT LOOKED IN 1875

All through the history of California, the great highways have been the connecting arteries of trade and inter-community activities. The trees of this section of the "Royal Highway" were planted about the time of the American Revolution by the mission padres.

## The Contractor-Dealers of El Camino Real

(The striking improvements of recent months which are to be noticed among the electrical retailing interests of California may largely be credited to the remarkable work of the California Electrical Cooperative Campaign, and this story of the dealers which serve the communities along the highways of the state is offered as a record of the achievements of this organization.—The Editor.)



In the early days of California the Spanish missions outlined a royal highway through the state which today connects a series of ever-growing and prosperous communities.

connecting roadway of the coast, while the Midland Trail, with its tributaries leading off to the foothills on either side, runs down through the great central valleys.

Along both these highways are groups of towns sufficiently alike in interest, with the same type of country back of them, so that they constitute a unit. Along the coast these are either formed by the successive little valleys which lead at angles to the sea, or center about a seaport with its numerous activities. In each of these districts is to be found a perfect network of power lines and in each a group of wide-awake electrical dealers who are intelligently serving the needs of their communities.

EL CAMINO REAL, the royal highroad of California, runs from the hill country just north of San Francisco down along the coast as far south as San Diego. In the days of Spanish glory, the road was the main artery of the life of the state, connecting the colorful, tile-roofed towns and busy mission settlements which were strung along its length like beads along a necklace. Just so today the the prosperous local districts are united by the great highways of the state. El Camino Real, itself, concrete paved and tree shaded, marked by the hanging bell at intervals at the roadside, is the great

The assistance of these dealers in their own self-improvement, the encouragement of interorganization and cooperation, and the general betterment of the service which is thus given the homes and industries of the state, has been the province of the California Electrical Cooperative Campaign. Three field agents have been kept busy in the field, going from district to district and from store to store, giving practical assistance in the meeting of problems as they arise. The record of improvements which have been instituted and of good feeling which has grown up between dealers and in all relations between dealers and power companies is eloquent testimony to the value of the service thus rendered by the campaign.

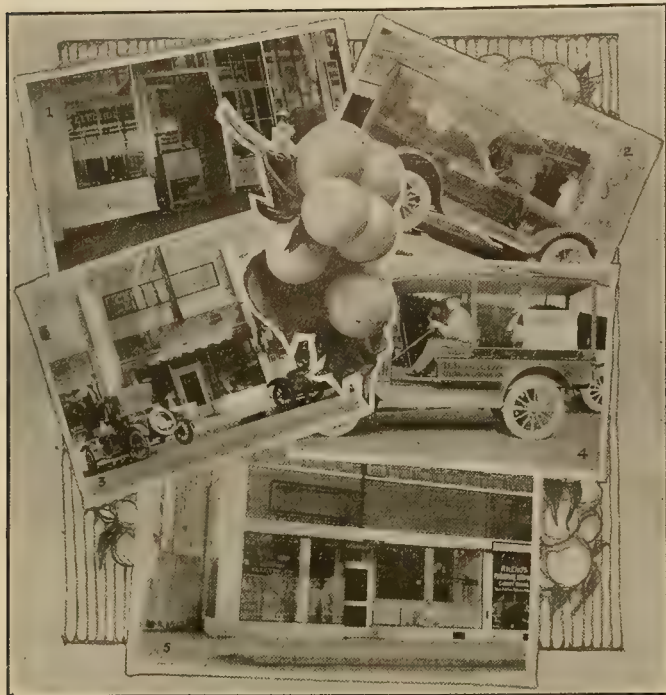
### Northern Bay Counties

The first of these local districts which forms a little center of prosperity at the head of El Camino Real is the region of the northern bay counties. This is made up of little valleys winding among the hills of the Coast Range, a district of fertile agriculture and of great activity in dairying and poultry. Petaluma, for instance, is world famous for its poultry industry and the extent to which electricity is used in all branches of this work. In this region, too, are found many of the scenic features of the state and such natural wonders as the petrified forest, mineral springs, red-wood forests and hill streams that bring motor parties and vacationists from all over the state. Particularly in that part of the territory which stretches down the eastern side of the bay, a considerable industrial activity has arisen, while Vallejo, of course, has the special interest of Mare Island Navy Yard.

An idea of the live character of the electric service which is being given this region is to be seen from the records of the California Electrical Cooperative Campaign, which report two new establishments within recent months, one that of F. C. Sherman in Rio Vista and one opened in Fair-



field by M. E. Parr. In Petaluma, where Bauer and Baugh and the Petaluma Electric Works serve the city, both electric stores have rearranged and improved their establishments. In Napa, Earl G. Wilson has rebuilt the interior of his store and added to his service by the employment of a sales-manager. Santa Rosa has two electric stores of importance,



#### FROM THE NORTHERN CALIFORNIA DISTRICT

1. The new store of Bauer and Baugh of Petaluma. 2. The Western Gas and Electric Company of Chico believe the delivery truck is an effective medium for advertising. 3. The Central State Electric Company of Fresno have doubled the size of their store. 4. Delivery truck of H. W. Jacobs, Santa Rosa. 5. The attractive new quarters of the Fresno Electric Co.

the Hayes Van Fleet Electric Company and H. W. Jacobs, and both these have greatly improved their working plant. The Solano Supply and Construction Company of Suisun has doubled the size of its store and added great improvements. These are only typical of the enterprise and progress which mark the district.

#### The Bay Region

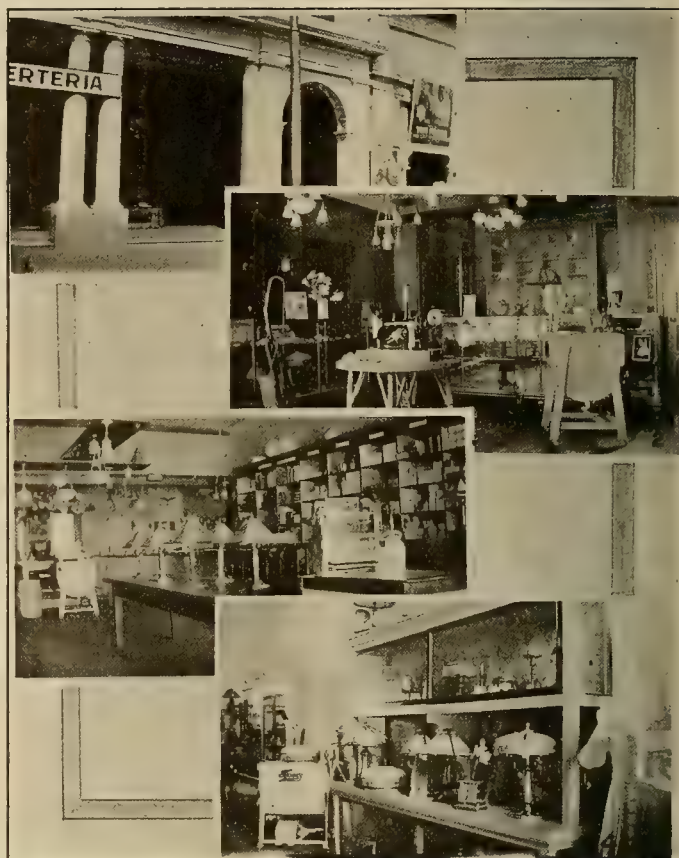
San Francisco, Oakland and Berkeley hardly need characterizing. Active groups of dealers cover these communities and live local contractor-dealer organizations meet inter-industry problems. New stores are continually growing up, both to meet the local requirements of residence districts and in the downtown section.

Just outside of San Francisco is a semi-suburban district which runs down through an area of industrial interests represented by South San Francisco to the residence district farther down the peninsular, just bordering on the agricultural region immediately beyond. Part of the electrical needs of this region, particularly that represented in the industrial center bordering the city are met by trips into San Francisco itself, but more and more the local dealers are taking over the business. In Burlingame the new Watts Electric Company with its pleasant interior and well decorated window is meeting the larger as well as the smaller household needs of its well-to-do residence district. J. A. Foster of San Mateo has made numerous improvements in his already attractive establishment and has been carrying out an active solicitor campaign. Redwood City is adequately served by Mark E. Ryan, who takes an active part in civic affairs as fire chief and city father, as well as handling all electrical business of the community.

#### Alameda County

The similar district outside of Oakland runs more promptly into an agricultural region. Some industrial interests and factories fringe the outskirts of the city and then follows a region of vegetable farms, fruit ranches and hay fields. An interesting feature of the region is the Portuguese settlement about Elmhurst, which is said to be the only settlement of this nationality in the United States.

Along the highway which unites these communities are located successive contractor-dealer establishments, each serving a given territory hardly overlapping that of the next division of the chain. Each store handles practically all the electrical interests of its districts—and the general use of electricity for household convenience as well as in the lighting of the homes is a tribute to the dealers who developed the interest and supplied the wants. Typical of the improvements which have been made in this district recently is the Andrews Electric Company of Elmhurst which has moved to a new location with a better working plant and tasteful



#### CONTRACTOR-DEALERS OF THE OUTLYING BAY DISTRICTS

1. The L. E. Morgan Electric Shop of San Leandro is located half-way between the office of the power company and the leading moving picture theater. 2. In Elmhurst the Andrews Electric Company has moved into well-arranged new quarters. 3. Mark E. Ryan of Redwood City has an open, well stocked store where he handles the complete electrical business of the community. 4. J. A. Foster of San Mateo has chosen gray and mahogany as an appropriate background for appliance displays with excellent effect.

fixtures. The shop is open and well arranged and a well chosen stock covers the demand of a growing industrial and farming region.

The L. E. Morgan Company of San Leandro has an extremely favorable location between the office of the power company and the principle moving picture show. Mr. Morgan has been greatly increasing his contracting business to meet the building prosperity which has marked the last few months. The store of Jacob Harder, Jr., of Hayward, also shows many improvements. The interior is artistic and effective in arrangement and flowers and a convenient chair help



to make it friendly for the customer. A large industrial business is handled by L. A. Vieux of Niles, where a fruit-packing plant of some size dominates the activities of the neighborhood.

#### Dealers of the Santa Clara Valley

The Santa Clara Valley district proper is well known for its specialized prune industry. Aside from the agricultural prosperity of the region, it is one of the beauty spots of the state and many beautiful residences mark its length, from Los Gatos to Palo Alto. The Blossom Festival of the spring and the charm of the surrounding hills in the summer make it a favorite spot for visitors and many resorts have grown up to care for this business.

Palo Alto is of course largely centered about the interests of Stanford University and its needs and activities are those of a college town, with seasons which follow closely the opening of the college terms. The Stanford Electric Company here specializes in household appliances and keeps several solicitors busy, following up its washing machine and appliance business. Werry and Roller have an attractive, open shop, which takes advantage of a combination with a paint and wall paper establishment to occupy half of a double store.

Sunnyvale, which has come to be quite an industrial center, as well as the nucleus of a small farming district, boasts a new store, that of F. X. Bodin, who for some time has handled the contracting business of the community from his own workshop, but who has opened a progressive shop in town to take advantage of appliance sales as well as to serve as a headquarters for wiring and other business of that nature.

All this district itself is historically of the greatest interest. The Mission Santa Clara was founded about the time of the American Revolution and was considered one of the favored locations by the mission fathers, who well recognized the fertility and beauty of the valley. A little closer to San Jose, along the historic Alameda, whose trees were planted in the early part of last century, is the interesting home of the late Judge Rhodes, the timbers for which were brought around Cape Horn in 1850.

#### San Jose Stores

San Jose itself is served by a group of enterprising dealers, each with his specialty. The Garden City Electrical Company has recently doubled the size of its store. The company undertakes farm work as well as city business and keeps from 20 to 21 men in the field handling pumping installations as well as cannery work and home wiring.

The San Jose Electric Company has a distinctive store arrangement, with colorful windows which present a most attractive appearance. Jewelers' cases with polished shelves which reflect the bright appliances, a particularly well arranged lamp display, a chair and telephone at the disposal of customers, help to make the store pleasing to the visitor. The establishment specializes in city work.

One of the most attractive stores of the district is that of Wagner Brothers, who handle fixtures as their specialty, together with other electrical appliances, as well as andirons, fenders and other home needs. The distinctive feature of the store is the series of individual rooms, each tastefully decorated, where the fixtures are displayed in their natural setting.

The Century Electric Company, of which the late Frank Somers was the proprietor, takes advantage of a narrow space most effectively, utilizing high shelves which are reached by the ladders customarily used in shoe stores. A mezzanine floor with a repair shop upstairs in the rear, not only adds to the appearance of the interior, but gives a light place for the work and takes it out of the way. An electric sign down the front, as well as the familiar slogan, "Don't worry," help to make this establishment a landmark of the community.

Among the other dealers of San Jose should be mentioned T. E. Baker and Sons, Inc., who occupy a most favorable location on the corner of Third and Santa Clara Streets, and who take good advantage of the window space thus offered, specializing in fixtures.

#### Progress of the Monterey Region

South along the highway from the Santa Clara Valley brings us next to the Monterey bay region, famous alike for its historic associations and its natural beauty. Monterey itself, of course, is known as the first capital of the state. Over the old customs house, which still stands, the American flag was raised for the first time in California. The Carmel Mission was the home mission of Junipero Serra himself and his grave is to be seen on one of the friendly hills of Monterey. Santa Cruz, Del Monte, and Carmel-by-the-Sea represent different phases of the summer life which takes advantage of the unusual picturesqueness of the coast line and the bracing summer climate. Aside from this more spectacular side of the district's life, a substantial farming and cattle industry is to be found throughout this region. Monterey itself is the center of an active fishing and fish-canning business, with its various related activities.

A most progressive spirit has been shown by the electrical dealers of this section. A new store is reported from Hollister, that of E. P. Greenep, who has added great improvements to a modern establishment. In Monterey the Noggle Electric Works have rearranged their store and added distinctive features to their merchandising service. J. A. Schanbacher of Watsonville has rearranged his store, with excellent results.

The Cox Electric Company of Santa Cruz have achieved interesting results in the careful arrangement of their store, while W. F. Blide, whose establishment, with that of the Cox Company, divides the service of the community, has moved to a new location and made effective changes in store arrangement and service.

All three dealers of Salinas have a record of recent improvements. The Posz Electric Shop is a new establishment



DOWN THE PENINSULA FROM SAN FRANCISCO

1. The Stanford Electric Company, one of the progressive stores which serve the college community at Palo Alto. 2. Werry and Roller of Palo Alto, who secure more open quarters by sharing a double store with a paint and wall paper establishment. 3. The "Palo Alto" (tall tree), which gives the name to the University town. 4. Watts Electric Company of Burlingame is located near a moving picture theater in attractive new quarters.



of a businesslike, well-arranged type. The Salinas Electric Works has doubled the size of its store and made notable changes in artistic arrangement. Anderson and Doyle specialize in farm plants and motor work and have enlarged their service to meet the active demand of the after-the-war period.

#### In the Vicinity of San Luis Obispo

Farther down the coast from the Monterey bay region is the prosperous agricultural district which centers about San Luis Obispo. Two new stores record the growth of this region, that of the Paso Robles Electric Shop of Paso Robles and the Valley Electric Company of San Luis Obispo. The Electric Shop of the same city has enlarged the interior of its up-to-date establishment and made striking improvements in arrangement and equipment. Both electrical shops which serve Santa Maria, the Krelle Electric Company and H. J. Anderson, have rebuilt their stores and are giving unusual and effective service to the community.

#### Coast Districts

Farther down along the coast is the beautiful vacation and agricultural district which centers about Santa Barbara. Both electrical dealers of this pleasant city, the Nielson-Smith Electric Company and Fred A. Downer and Company,

Los Angeles itself has some forty-two progressive electrical shops, among which twelve are new establishments, nine have recently moved to new locations nearer the center of business activity, and all give evidence of important improvements in equipment and service. Pasadena reports one new store and the remaining seven which were already established have greatly bettered their already up-to-date service.

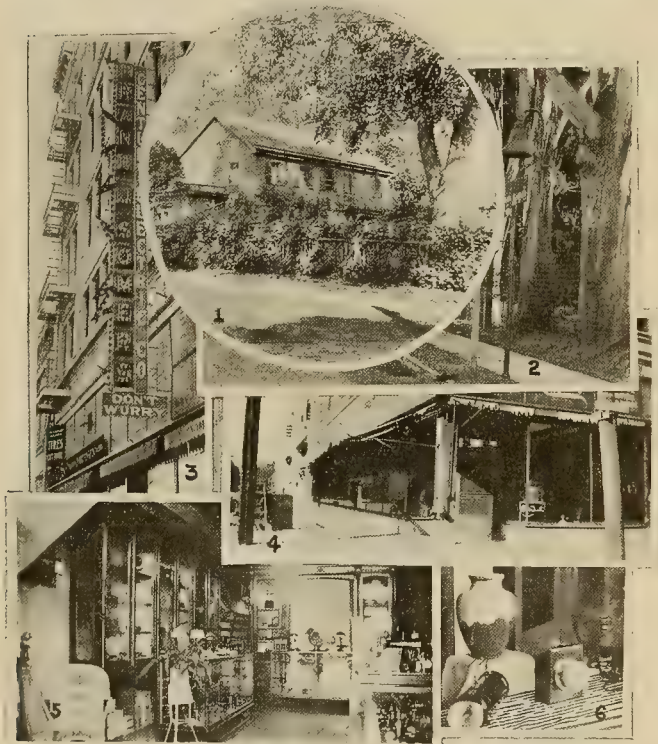
The country in the vicinity of Los Angeles is similarly served. In Hollywood, the Hollywood Electric Shop has entirely rearranged its store along distinctive lines and the establishment of Thos. F. Marshall has adopted many modern improvements. The Jacobs Electric Company of South Pasadena have made comprehensive changes in recent months with striking results. Monrovia has an attractive new shop, that of H. N. Jackson, while H. P. Lingo, who has been serving the community, has made several progressive changes in advertising methods. T. W. Pemberton has opened The Electric Shop in Huntington Park with a carefully chosen stock, and in Inglewood R. D. Aylesworth has enlarged his store and moved into a better location.

Glendale has one interesting new electrical store, the Jewel Electric Company, while both the J. A. Newton Electric Company and the Glendale Electric Company of the same town have remodeled their business quarters to excellent effect. Among the new stores of this general locality are: Winder and Jones of Azusa (this is one of the series of attractive stores managed by this company), the Burbank Electric Shop of Burbank, the El Monte Electric Shop of El Monte, the Phillips Electric Company of Santa Paula, and an artistic store in Van Nuys opened by L. S. Granger. The Smith Plumbing and Electric Company of Van Nuys have also effectively rearranged and refinished their place of business. Several stores have found it possible to move to new quarters, generally nearer the business center of town, and in each case more spacious and modern. The Fillmore Electric Shop of Fillmore is one of these, while in Oxnard, J. L. Mitchell has moved his enterprising business to a new store with improved facilities. Wilson's Electric Shop of San Fernando, T. H. Armstrong of Santa Paula, and the Sierra Madre Electric Company of Sierra Madre are also among the progressive dealers who have bettered their location and working plant.

H. P. Gerckens of Puente has recently made tasteful changes in stock arrangement which have greatly improved the appearance of his store and the Gardena Electric Works of Gardena have undertaken a comprehensive revision of their equipment with excellent results. Among the notable progressive advances in this district which should be noted are the improvements recently instituted by William Coryell of Burbank, the La Verne Electric Company of La Verne, R. P. Farrell of Oxnard, R. E. Charles of San Fernando, all of whom have rearranged or added to their stocks and furnishings. Winder and Jones have also remodeled their branch in Glendora to most successful effect.

#### Progress in Orange County

Just south of Los Angeles is a group of communities which center about Anaheim and which are most of them located in Orange county. This region is largely agricultural, but a group of oil fields also occurs here and a certain number of associated industries have grown up. Anaheim, which is one of the early Dutch settlements in California, is perhaps unique among the towns of the state in the record of new electrical shops which have been opened here within the last few months, all four of its distinctive stores having been established within this time. They are the Anaheim Electric Company, the F. A. Clarke Company, the Holland Electric Shop and the pleasant store of Joseph Lieb which has just been opened up. The Brea Electric Company of Brea also entered the field a few months ago and is giving modern



#### SCENES OF ELECTRICAL INTEREST ABOUT SAN JOSE

1. A landmark of the early days of El Camino Real—the home of Judge Rhodes, timbers for which were brought around Cape Horn in 1850. 2. The hanging bell marks the highway all along its length. 3. The "Don't Worry" slogan and an electric sign mark the front of the Century Electric Company. 4. T. E. Baker and Sons make good use of a corner frontage. 5. The well-planned interior of the San Jose Electric Company, and 6. A corner of its colorful window.

have moved to new quarters and fitted up their places of business with all modern equipment. Two new stores are reported from Ventura, the Phillips Electric Company and the Ventura Electric Company, both well designed and businesslike, and the establishment of John A. Behn has made several improvements in its stock arrangement and general service.

#### Los Angeles and Surroundings

The southern district of California is of course well known for its climatic and scenic beauty, as well as for the intensive development along horticultural and agricultural lines.



service in every respect. In Artesia, the shop of George Purviance has a record of numerous improvements.

Hall's Electric Shop in Downey has made minor improvements in several branches, and in Fullerton the Reid Farley Electric Company have completely remodeled and effectively reorganized their entire establishment. Moran and McWhinney of Hermosa have also tastefully remodeled their place of business to excellent effect. Orange itself now has two electrical retailers, of which the Orange Electric Company is a new establishment and the J. G. Robertson Electric Company has recently added numerous improvements which complete its up-to-date service. Four new stores have opened attractive quarters in Santa Ana—the Groninger Electric Service Company, the Granger Electric Company, the F. A. Clarke Company, associated with the other stores in the same territory under that name, and The Electric Shop.

Both the Cope Electric Company and the J. G. Robertson Electric Company, which has a branch in this town, have enlarged their stores and remodeled the interior and furnishings. In Whittier the Stedman-Manson Electric Company have moved into a larger store and made various discriminating changes and C. L. Davis of the same community has modified his equipment and methods along many modern lines.

#### San Bernardino and the Orange Belt

San Bernardino is the nucleus of what is known as the Orange Belt, a region devoted to orange growing, as its name implies, but also containing great stretches of bean lands and general agricultural development. The dealers of this region are not behind the general prosperity of the district. San Bernardino itself is now served by four dealers, a new store having been opened within the last year by F. A. Clarke.



#### ATTRACTIVE STORES IN SOUTHERN CALIFORNIA

1. Window display of the Cope Electric Company, Santa Ana. The window is well designed to effectively display electrical appliances and it is always dressed attractively.
2. A fern and flower basket used by Snyder and Bell, San Bernardino, to add a touch of color to their artistic shop.
3. Advertising display rack of the Reynolds Electric Company, Santa Barbara. This rack is placed to advantage on a display table and metal post card racks are used to hold manufacturers' literature.
4. Fish bowl from the carefully designed interior of Snyder and Bell's electrical store in San Bernardino.
5. A display by the Southern California Electrical Company of San Diego in the office of the central station.
6. A front of the fixture display rooms of the Cope Electric Company, Santa Ana.



Both the Field Electric Company and Snyder and Bell of this city have remodeled their interesting establishments to good effect, and the Prest Electric Company reports minor changes of importance. Two other new establishments have recently opened in the Orange Belt, Hall and Bashore, with a well arranged shop in Covina, and F. A. Clarke Company in Riverside, a branch of the progressive new store in San Bernardino.

Winder and Jones have followed their enterprising custom in their Covina branch by moving into an attractive building in a better location. Clark's Electric Shop of Claremont has made numerous changes in the interest of improved service. In Colton, the Colton Electric Shop has tastefully rearranged its quarters and greatly improved the appearance of its attractive shop. Guy E. Ankrum of Hemet has also found it possible to better his location by moving into a new distinctive store. The Granger-Hall Electric Company of Ontario have maintained their same quarters, but have entirely refinished the interior and remodeled their windows with most satisfactory results.

Both electric stores of Pomona, the Harrison-Fitch Electric Company and the Pomona Fixture and Wiring Company, have made comprehensive improvements in equipment and methods, while in Redlands a similar record has been made. Of the two enterprising shops which serve this community, the Independent Electric Company have moved into a new store in a better part of town and the Southwest Electric Company have undertaken a complete modernization of their working plant. In this district there remain only to mention the Coldrens Electric Shop of Riverside, which has numerous innovations to its credit, and the Riverside Electric Company of the same city, which has brought its place of business to the front rank among merchants of the city by the recent changes effected in moving to new quarters in a more active location.

#### The Long Beach District

Long Beach forms the center of a coast district around which an interesting group of towns is located. Long Beach is the largest of these and here an active association of contractor-dealers serves the interests of the communities. Four new stores have grown up here within recent months, the American Electric Shop, the Long Beach Electric Company, the Acme Electric Company and the F. A. Clarke Company, who have also established a branch in this city. Of the older companies, both the Lane Electric Company and the Lantz Electric Company have remodeled and refinished their business quarters with modern and distinctive innovations. The Lewis Electric Company has instituted minor improvements to good effect and the Marsh Electric Company have moved nearer the active business district of town with enlarged facilities for up-to-the-minute service.

Ocean Park also reports extensive improvements in its electrical shops. The D. S. McEwan Electric Company have remodeled their store to a well designed plan and the Electric Shop has made minor changes in the interests of improved service. Similar improvement is reported by the establishment of Geo. S. Funk and Son of Redondo. San Pedro has two progressive stores, both of which have made striking improvements in recent months. These are the San Pedro Electric Company and Green's Electric Store, which has refurnished and remodeled its quarters. Santa Monica has one new store, Gould's Electric Company, which opened some months ago, and two other modern establishments, the Coast Electric and Machine Company and the Santa Monica Electric Shop, which report various minor changes along lines of effective merchandising. The Torrance Electric Shop has recently moved into a new building which gives larger scope to its businesslike service and both electric shops of Venice are distinctive and up-to-date. The Laseter and Billings

Electric Company has recently opened an artistic shop, while the Coast Electric and Machine Company, a branch of the Santa Monica store of the same name, has remodeled its show windows and greatly improved the appearance of the business quarters.

#### Dealers of the Imperial Valley

The Imperial Valley is a distinct division by itself. It was perhaps first called to public attention some years ago when the Colorado river turned aside its course and flowed for a while into what is now the Salton Sea. The Spanish name for the place is La Palma de la Mano de Dios, "the Palm of God's Hand," a poetic reference to the fact that a great stretch of the valley's area is below the level of the sea. The great agricultural fertility of the soil under irrigation has led to intensive development within recent years and the valley is already famous for its canteloupes and cotton, as well as for dates and other tropical products. Of course, the commercial and mercantile activities of the valley have shared in the rapid growth and a group of progressive dealers now serves the needs of the district.

Brawley has two active electric shops, one of which has recently been opened by F. H. Myers, while the Akin Plumbing and Electric Shop, which has been established for



A FRESNO GROUP

The Valley Electrical Supply Company of Fresno, with its employees lined up in front of the store. Fresno has one of the progressive groups of electrical dealers which are typical of the central valley region.

some time, has moved into up-to-date quarters nearer the center of trade. Calexico also has one new store to its credit, the attractive Graham Electric Company. The Strawn Electric Company of the same town has transferred its headquarters to a better location where it is carrying on its efficient service. The Strawn Company also has a progressive branch in El Centro. The Southern Electric Company, of which C. H. Heilbronn is proprietor, is likewise represented in this city by a shop of that name which has recently opened artistic quarters, and C. F. Ferguson, of El Centro, has numerous notable improvements to his credit.

#### San Diego Activities

San Diego is the most southerly of the important cities of the state, being located on the coast just across from the Mexican border. The climate is one of particular evenness and the scenic beauty of the surrounding region and coast line have made the place one familiar to vacationists and visitors from the East. The electrical dealers of this city are well equipped to give the up-to-date service required of them. Two of the stores have recently moved into new locations and modernized equipment—the Burton Electric Company and the Whenn Electric Company. The Hartwell Electric Company has remodeled and refinished its entire establishment with effective results, and R. L. Jennings has greatly improved the appearance of his place of business through the well-planned innovations which have recently been made. Various changes in the interest of progressive service are credited to the other dealers of town, C. F. Cunningham, the Independent Electric Company, the San Diego Gas and Elec-



tric Appliance Company, and the Southern Electrical Company. A second branch of the Southern Electrical Company has also been opened recently with well arranged quarters and stock.

### The Valley Highway

El Camino Real itself really ends at San Diego, but a similar line of highways extends down the length of the Sacramento and San Joaquin valleys, the center of the state's prosperity. The two mountain ranges border either margin of the state, joining hands at Shasta on the north and Tehachapi on the south, leaving a great area which is some six hundred miles in length and a hundred and fifty miles across, and whose level is hardly broken even by slight undulations. The northern half of this plain is served by the Sacramento river and its various tributaries, while all the region south of San Francisco bay is dominated by the San Joaquin. The two rivers join just above San Francisco Bay and flow together through this drowned valley which was once their delta into the Pacific.

### Sacramento Valley Dealers

The Sacramento Valley district comprises all this territory north of Sacramento. Its interests are those of general agriculture, with especial attention at the present time to the developing rice industry. The record of progress of the electrical dealers of this region has not been behind that of the agricultural. This was one of the latest sections to be included under the work of the California Electrical Cooperative Campaign, but it already has an active interorganization of its own and practically every dealer in the district has made improvements in the actual physical equipment of his establishment as well as in the adoption of up-to-date merchandising methods.

The John T. Morgan Company of Corning has opened a completely equipped electrical department with a comprehensive stock and a pleasant store arrangement. In Redding, the Shasta Electric Works have rebuilt the interior of their store and made notable improvements with effective results. Red Bluff boasts a new store recently opened by J. L. Thackrey.

A new store is also reported from Chico, that of J. W. Northedge, which is particularly attractive and well arranged. Both the other stores which serve this city have moved to new locations and greatly improved their equipment. W. S. Cass has a well stocked and tastefully designed establishment in a good neighborhood, while the Western Gas and Appliance Company has put in a fine new store with all modern improvements.

Similar progress is reported from Oroville, where the Electric and Auto Supply House has bettered its location and is now established in well arranged and up-to-date new quarters. A new shop has been opened by Doren Russell in Colusa and in Orland the Campbell Electric Company has effectively remodeled its quarters. Marysville now has three electrical dealers, all of whom have increased their business within recent months. Henry Berg has moved his shop to new quarters, the Geo. W. Roberts Company has added to its completely equipped and well planned electrical department, and T. Syversen and Son, who have recently joined the association, report good progress in both contracting and dealing departments. A. R. Hancock of Watsonville has moved his store to a better location and his many improvements in arrangement of stock and artistic setting have greatly added to the distinction of his shop.

An up-to-date new establishment has been opened in Roseville by R. K. Perry and the Holt Electric Shop has also been added to the group of contractor-dealers serving Woodland. Fred Weider's Electric Shop of that city is seeking new quarters with the idea of improving location and shop arrangement.

### Sacramento and Stockton

Sacramento itself has one of the most progressive groups of dealers in the state and its electrical shops are both attractive in appearance and effective in service. One new store has been opened within recent months, the interesting establishment of the Sterling Electric Company, which is unique in the up-to-date ideas which have been worked out in its design. Two stores have moved to new locations better situated as regards the shopping district—The Electric Shop and the Sacramento Appliance Company—and each has made striking changes in arrangement and artistic stock display. The California Mechanical and Electrical Engineering Company, as well as the Electrical Supply Company and the J. C. Hobrecht Company, have remodeled the interior of their stores with most satisfactory and effective results.

Stockton is unique in the number of attractive establishments which serve it, seventeen dealers being listed in this group. Of these, six are new shops, recently opened: the Bright Spot Electric Company, the Eddie Electric Company, the Electric Utilities Company, the Electric Appliance Shop, the United Electric Store and the Washing Machine Store. Three dealers have moved to new quarters and made progressive modifications in stock arrangement and up-to-date merchandising methods. These are the Commercial Electric Company, Gould the Light Man and the Patzer Electric Shop. The Stanley Electric Company, who specialize in motor work, have greatly improved their working equipment.

Both Stockton and Sacramento are situated in the heart of the agricultural district and are the shipping centers for fruit, grain and general market products. Stockton, in particular, has developed an active industrial district and the electrical dealers of that region are called upon to supply the needs of flour mills, glass works, and like enterprises.

### The Sierra District

The so-called Sierra district is next along the highway south from Stockton. This is in part a general agricultural district, but considerable attention is also devoted to the dairy industry. This was formerly the great cattle range of the Miller and Lux Company, which historical association perhaps accounts in part for the present activities along dairying lines. A sugar beet factory is located at Manteca and there is an investigation now under way in the hope of locating oil in this district. Six new stores are credited to this territory, as well as a group of active dealers already established who are continually improving their service.

In Oakdale, an attractive new establishment has been opened by A. C. Sipes. The Sullivan Electric Company of Modesto have also opened a fine new shop of unusual distinction and the Turner Hardware and Implement Company have added a complete and well-planned electrical department, under the management of C. C. Davis, formerly with the California Electrical Cooperative Campaign. The shop of J. M. Nightingale in the same community has been doubled in size to meet increased business, while Harrington and Lentz have made noteworthy improvements in stock arrangement and equipment.

Merced also claims an additional store which has recently been opened under the name of the E & S Installation Company, who have made unusual improvement in all branches of their work, and an additional shop has been opened in Madera, that of the Madera Electric Works, with an inclusive stock and well-designed appointments. Chas. Eyeman of the same town has also moved to a more favorable location and remodeled the interior arrangement of his shop to excellent effect. Another new store of the district is that of R. G. Murphy at Los Banos, a modern and effectively planned establishment.

Turlock is the center of a growing region, especially devoted to the raising of canteloupes and sweet potatoes, and



its electrical establishments reflect the progressiveness of the community. The C. E. Osborn Company here has reorganized its electrical department and made many improvements, and recently a new store has been opened by Roberts and Henderson which is modern in every detail.

The Mixer Electric Company of Lodi have recently rearranged their entire place of business, instituting many new features of a progressive nature, and a new establishment has been opened in Tracy, that of the Tracy Electric Works, which adequately serves that district.

#### The Center of the State

The Fresno district, a little farther south in the valley, is located in the exact geographical center of California. The region is one of unusual prosperity. It is the center of the fig and raisin industry and has developed besides its agricultural interests, an active group of industries directly associated with its agricultural resources, such as fruit packing houses, electrical refrigeration plants and factories devoted to the utilization of by-products.

The Valley Electrical Supply Company is the largest of the contractor-dealer establishments within Fresno itself and stands out as one of the most progressive stores in the entire state. They have recently rearranged the interior of their extensive quarters and have enlarged and remodeled the appliance department, which is one of the features to which they devote special attention. Each of the other dealers in town has greatly improved his establishment. The Electric Motor Shop and the Buford Electric Company, which specialize in motors and washing machines respectively, have each moved to new locations with much improved quarters. The Fresno Electric Company is also in a new home with modern and well arranged equipment. The Central State Electric Company has doubled the size of its store and is increasing its activities in outside sales work, while the Lewis Electric Company has rebuilt the entire interior of its shop with the most artistic results.

A modern new store has been opened in Selma by the Townsend Electric Company and the establishment of J. C. Limeburger in the same town has moved to an improved location and made many changes in the effective planning and arrangement of his store. In Dinuba the Dinuba Electric Company has made notable progress and in Hanford, O. F. Abbott has rebuilt the interior of his shop and added many attractive features in design and equipment.

Both electrical shops of Visalia have made numerous improvements. The Chaffee Electric Company has rearranged its quarters and opened a branch shop to care for its growing business, and the Visalia Electric Works has remodeled its store front and stock arrangement and completed the tasteful details of the shop interior. The E. M. M. Service Company

of Lindsay has moved into fine new quarters where they occupy the entire building to themselves. The Central California Electric Company of the same community have reconstructed the interior of their place of business with most excellent effect.

A new store has been opened in Porterville, known as the Porterville Electric Works, with an adequate and well-chosen stock. A. R. Parsons, of Porterville, is also planning several progressive additions. In Coalinga E. B. Anderson has moved to a new location and achieved most pleasing results in the rearrangement of stock and store furnishings, and in Lemoore the new store which recently started as the Foley Electric Company is well planned and up-to-date. Tulare has two progressive establishments, the Crowe Hardware and Electrical Works, which specializes in motors, and R. E. Rounsaville and Company, who have recently bettered their location and fitted up new quarters in an attractive way.

#### Oil and Agriculture

The Kern district is located farthest south in the San Joaquin Valley and its special interests are those of agriculture and cattle raising, with most extensive oil development in the region of Bakersfield, where the several great oil fields of the state are located.

One interesting new store has been opened in Bakersfield—that of J. E. Baker—and the Star Electric Company, as well as the Kern Valley Electric Company, have both greatly improved their places of business. The Star Company has moved to a better location and has modernized its equipment throughout, while the Kern Valley Company has rebuilt the entire interior of the shop and instituted many other changes in the line of progress. R. S. Freels has built a new store in Delano which is well planned to meet the needs of the community and in Taft the Union Electric Company have rebuilt the front and interior of their store, adding many new features of interest. The McFarland Electric Works, of McFarland, have recently taken a progressive step by joining the state association.

#### The Work of the Cooperative Campaign

Thus the new Camino Real joins thriving modern communities, as the old shaded roadway brought together the picturesque but slow-moving settlements of the Spaniards. The list which has here been given of alert and prospering dealers is of course in no way complete, but it gives an idea of the wide-awake nature of the service along electrical retail lines which is not only answering but stimulating trade in all parts of the state, a satisfying condition which the California Electrical Cooperative Campaign has had an important part in bringing about.



A NEW MISSION AND AN OLD

The California Electrical Cooperative Campaign has a mission of helpfulness to the electrical retailing interests of the state which is bearing fruit in the wide-awake service which is being rendered the public up and down the length of the highway. Here is L. H. Newbert, chairman of the Advisory Committee of the Campaign, standing in front of the San Juan Capistrano Mission in company with Robert Sibley, editor of the Journal of Electricity, Frank Gray, and Henry Bostwick of the Pacific Gas & Electric Company.





**THOMAS M. DEBEVOISE**  
Counsel  
Electric Supply Jobbers' Ass'n  
New York



**T. E. BIBBINS**  
Pacific States Electric Co.  
San Francisco



**W. R. HERSTEIN**  
Electric Supply Co.  
Memphis  
Chairman, Central Division



**A. M. LITTLE**  
Mohawk Elec'l Supply Co.  
Syracuse  
Chairman, Atlantic Division

## DEL MONTE CONVENTION

OF THE

### Electrical Supply Jobbers Association

The special train of the Electrical Supply Jobbers from the East is due to arrive at Del Monte on the afternoon of Monday, May tenth. On arrival at the hotel the guests will have none of the usual worries with their baggage, on account of an original scheme worked out by the Hotel Transportation and Reception Committee. The special train will be met at Sacramento by members of the reception committee who will give each passenger a card showing the room that has been assigned to him, eliminating the necessity of each guest registering upon arrival at the hotel. On the train all baggage checks will be taken up by members of the committee and hand bags will be tagged with the name and room number of the guest so that shortly after arrival at the hotel all of the baggage will be delivered to the guest's room.



**G. W. JOHNSTON**  
Mid-West Electric Co.  
Omaha



**C. C. HILLIS**  
Electric Appliance Co.  
San Francisco  
Chairman, Pacific Division



**W. S. BERRY**  
Western Electric Co.  
San Francisco



**F. M. BERNARDIN**  
B. R. Electric Co.  
Kansas City



**GEO. H. CURTIS**  
Sales Manager  
Electric Ry. & Mfrs. Sup. Co.



**E. W. ROCKAFELLOW**  
Western Electric Co.  
New York



**C. B. HALL**  
Illinois Electric Co.  
Los Angeles



**J. G. JOHANNESSEN**  
Southern Electric Co.  
Baltimore



**P. STERN**  
Interstate Electric Co.  
New Orleans



**H. W. MATTHEWS**  
Matthews Elec. Supply Co.  
Birmingham

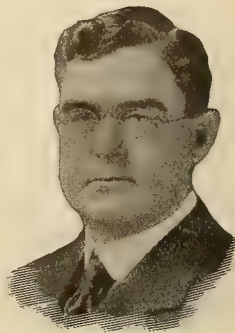




**H. J. GUNDLACH**  
Mine & Smelter Supply Co.  
Denver



**ALBERT H. ELLIOT**  
Sec'y, Pac. Coast Div., E. S. J. A.  
San Francisco



**C. W. HOBSON**  
Southwest General Elec. Co.  
Dallas



**C. T. MCKINSTRY**  
Erner Electric Co.  
Cleveland



**D. E. HARRIS**  
Pacific States Electric Co.  
San Francisco

**TUESDAY, MAY ELEVENTH**, will be spent in resting up from the trip, and excursions have been planned to the various points of interest around Del Monte. Doubtless a number of the guests will try out the golf links preparatory to the tournament which will form part of the sports program. In the evening Robert Sibley, editor of the Journal of Electricity, will give a talk on "The Vision of the West," which is a comprehensive survey of the present wonderful development in the electrical industry and of merchandising practice west of the Rocky Mountains. The lecture will be accompanied by a series of lantern slides and will be given in a non-technical style that will be of interest to the ladies as well as the members of the association.



**F. H. STEWART**  
F. H. Stewart Electric Co.  
Philadelphia



**J. C. DAVIDSON**  
Hendrie & Bolthoff  
Denver

**WEDNESDAY, MAY TWELFTH**. In the morning and evening the Divisions will meet separately in executive sessions for the transaction of such business as may be brought before them. The afternoon will be devoted to sports and the members will spend the time getting into par form for the golf and tennis tournaments which start the next day. All entries for these tournaments must be in the hands of the committee before 5 p.m. During the evening a '49 camp will be conducted in the billiard room. This camp will be a vivid and realistic reproduction of one of the mining camps of the West as it existed in "the days of old, in the days of gold, in the days of '49," and an interesting time is promised to all, especially to the visitors from the East who have never seen anything of the sort.



**W. E. ROBERTSON**  
Robertson-Cateract Electric Co.  
Buffalo



**H. C. LUCAS**  
Philadelphia Electric Co.  
Philadelphia



**H. D. RANDALL**  
Capital Electric Co.  
Salt Lake City



**JAMES CLARK, JR.**  
James Clark Jr. Electric Co.  
Louisville



**G. S. SMITH**  
J. F. Buchanan & Co.  
Philadelphia





**SAMUEL H. TAYLOR**  
Electric Ry. & Mfrs. Sup. Co.  
San Francisco



**N. G. HARVEY**  
Illinois Electric Co.  
Chicago



**B. B. DOWNS**  
St. Paul Electric Co.  
St. Paul



**F. N. AVERILL**  
Fobes Supply Co.  
Portland



**J. J. COOPER**  
Mountain Electric Co.  
Denver

**THURSDAY, MAY THIRTEENTH.** At 10 a.m. there will be a meeting of all of the Sections in general convention and John A. Britton will address the meeting on the "California Electrical Cooperative Campaign," giving the central stations point of view. During the meetings of the general convention on Thursday and Friday mornings the California Electrical Cooperative Campaign will be discussed by the Association which will be addressed by Lee H. Newbert, chairman of the Advisory Committee of the Campaign, D. E. Harris, of the Advisory Committee, and Clyde H. Chamblin, president of the California State Association of Contractors and Dealers. The tennis tournament is scheduled to start at 9 a.m. and the Kickers Handicap Medal Play of the golf tournament will take up the afternoon, which has been set aside for sports. In the evening Albert H. Elliot, secretary of the Pacific Division of the Association, will address the members on "California and the Association."



**G. W. PROVOST**  
Union Electric Co.  
Pittsburgh



**ANDREW CARRIGAN**  
Dunham-Carrigan & Hayden  
San Francisco

**FRIDAY, MAY FOURTEENTH.** Nine-thirty a.m. has been set for the opening hour of the general session which will take up the morning. In the afternoon will be held the final play in the men's singles and the woman's singles in the tennis tournament, and the woman's putting contest and the Medal Play, which is open to both men and women in the golf tournament. In the evening a brief business meeting will be held which will be followed by the Ball. During the ball the winners of the various plays and tournaments will be announced and the prizes will be awarded. These prizes have been contributed by the jobbers and manufacturers of the Pacific Coast.



**H. L. WALKER**  
Henry T. Walker Co.  
Detroit



**F. E. BLAKE**  
Hawaiian Electric Co.  
Honolulu



**O. B. STUBBS**  
Stubbs Electric Co.  
Portland



**W. W. LOW**  
Electric Appliance Co.  
Chicago



**F. S. HARDY**  
F. S. Hardy & Co.  
Boston



## Electrical Supply Jobbing Business in the West

(The West has ever been noted for its merchandising methods. Here is a brief resume of the principal jobbing houses that have made this section of our nation such a strong contributor to ideals of service and cooperation that today make the electrical industry in the West stand out as pre-eminent in sections of the country so far as institutions of this nature are concerned. —The Editor.)

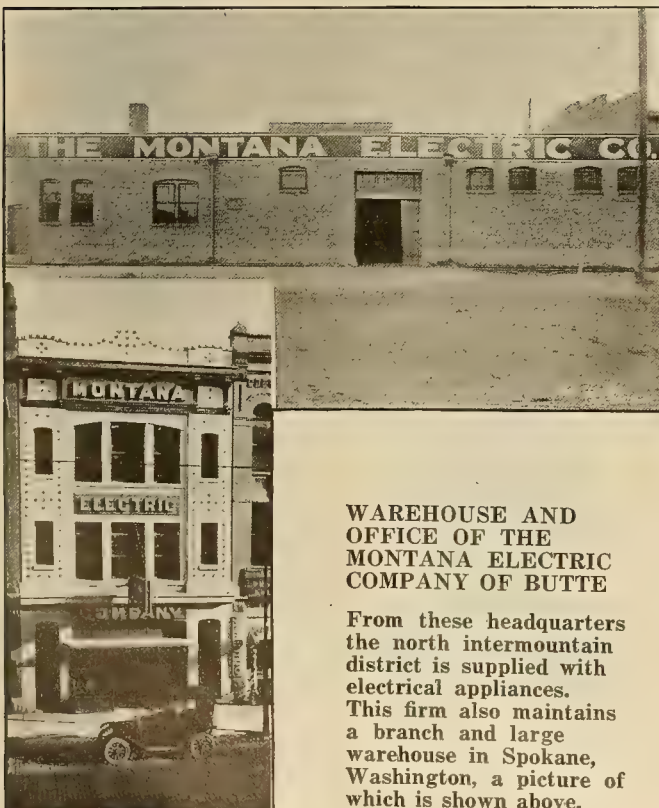
The five states of California, Oregon, Washington, Montana and Utah, and one territory—Hawaii—are included in the Pacific Division of the Electrical Supply Jobbers Association, a vast territory stretching from the snow-covered Rockies to the tropical



**THE WASHINGTON ELECTRIC COMPANY**

Office and warehouse of the Washington Electric Supply Company, Spokane. This is a branch of the Montana Electric Company of Butte and handles the business of that firm west of the Cascade mountains.

isles of the mid-Pacific, and from the Douglas firs on the Canadian shores of Puget Sound to the cactus of the Mexican deserts.



**WAREHOUSE AND OFFICE OF THE MONTANA ELECTRIC COMPANY OF BUTTE**

From these headquarters the north intermountain district is supplied with electrical appliances. This firm also maintains a branch and large warehouse in Spokane, Washington, a picture of which is shown above.

The Capital Electric Company of Salt Lake City also maintains a branch in Butte, Montana, under the name of the Butte Electrical Supply Company, and cover the territory of Utah, Idaho, Nevada, Wyoming and Montana. A house organ known as the "Generator" is published monthly and acts as an accessory salesman, being mailed to all of the dealers, central stations and industrial plants in their territory. Mr. H. D. Randall is manager.

The Intermountain Electric Company of Salt Lake City have an up-to-date establishment and also cover the inter-mountain territory, with C. B. Hawley as its active head.

The Montana Electric Company in Butte handle the north inter-mountain territory and maintain a large warehouse in Great Falls and a branch establishment in Spokane, Washington, under the name of the Washington Electric Supply Company. H. W. Turner is president with H. L. Bargion as manager.



**SHOW WINDOW OF STUBBS ELECTRIC COMPANY**

This effective display of lamps and appliances in the windows of this up-to-date Portland jobber has played a large part in the building up of his business. The Stubbs Electric Company firmly believes that windows should be ornamental as well as useful.

The North Coast Electric Company of Seattle, with its branches in Tacoma, Washington and Portland, Oregon, covers the Puget Sound district. Harry Byrne is manager.

The Fobes Supply Company maintains large warehouses in both Portland and Seattle and is the oldest electrical supply jobber in the Northwest, having been established since the late nineties. F. N. Averill is manager at Portland and Phil Aaron is manager at Seattle.

In the Stubbs Electric Company, Portland has a live jobber with Mr. O. B. Stubbs directing the activities of the company.

Marshall-Wells Company have their main office in Portland with a branch in Spokane to look after their interests east of the Cascades.



The Hawaiian Electric Company, Ltd., of Honolulu, cover the mid-Pacific area which includes all of the islands of the Hawaiian archipelago that are served with electricity. Frank Blake is manager.

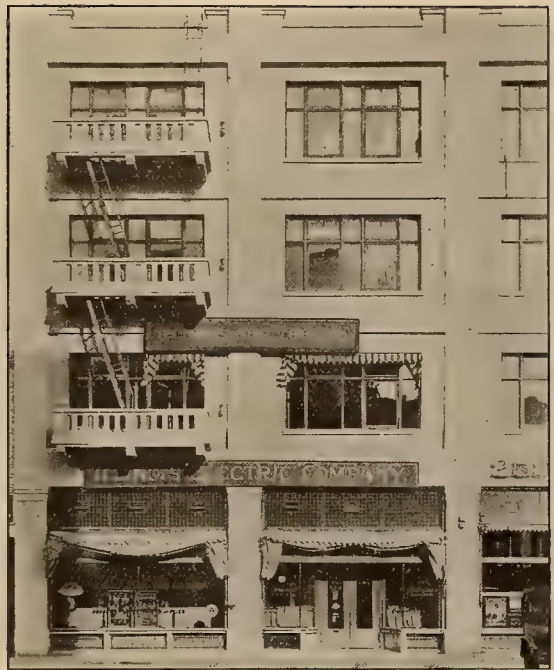
The Illinois Electric Company of Los Angeles is a branch of the Chicago company of the same name and has been established in the southern part of California since 1902. C. B. Hall is the active head.

The Graham-Reynolds Electric Company, which operates in the city of Los Angeles and the territory south of the Tehachapi Pass, has a thriving business and is using the latest methods of approved salesmanship. Newt Graham is the manager.

Listenwalter and Gough, Inc., have a modern establishment in Los Angeles that is holding its own and getting its share of the business in that territory.

The Gilson Electric Supply Company of Oakland cover the east bay territory satisfactorily with a live establishment.

The Pacific States Electric Company, which has branches in San Francisco, Seattle, Spokane, Tacoma, Portland, Oakland and Los Angeles, also maintains warehouses in San Francisco, Seattle, Portland and



**EXTERIOR OF ILLINOIS ELECTRIC COMPANY, LOS ANGELES**

This thriving branch of the Illinois Electric Company of Chicago, under the able management of C. B. Hall, has been active in the electrical jobbing business in Southern California since the early part of this century.

The Electric Appliance Company, which was incorporated in San Francisco in 1904, is closely



**GRAHAM-REYNOLDS COMPANY'S ESTABLISHMENT LOS ANGELES**

This modern two-story building is the home office of Graham-Reynolds Company and from here the highly effective selling force of the company are directed in covering the territory south of the Tehachapi.

Los Angeles. This company was incorporated in 1909. T. E. Bibbins is president, with D. E. Harris vice-president and salesmanager.

The Electric Railway and Manufacturers Supply Company is the oldest jobbing firm in San Francisco and on the Pacific Coast. It was incorporated in 1898 and handled principally insulating material and overhead line material. Since that time the specialty of the company has been insulating material and it has been a pioneer in this branch of the industry in the United States. Samuel H. Taylor is general manager.

The Holabird Electric Company, with its main office in San Francisco, has a branch office in Oakland. R. D. Holabird is general manager.

The Alexander and Lavenson Electric Supply Company of San Francisco is one of the younger jobbing houses of the bay region, whose business is growing rapidly.

Dunham-Carrigan and Hayden entered the electrical jobbing field in conjunction with a wholesale hardware business. Mr. C. E. Wiggin is in charge of its electrical department.



**ERMSCO BUILDING IN SAN FRANCISCO**

Mr. Samuel H. Taylor, general manager of the Electric Railway and Manufacturers' Supply Company, and incidentally the "daddy" of the electric supply jobbers on the Pacific Coast, holds forth here. From his office come words of wisdom, the result of long experience in the game.





#### INTERIOR OF THE ELECTRICAL APPLIANCE COMPANY'S OFFICE

This modern San Francisco office, which was specially designed for an electrical jobber, has all of the advantages of proper lighting and showcase room to properly display the goods carried in stock.



#### EXTERIOR—ELECTRIC APPLIANCE COMPANY

After the San Francisco fire of 1906 the Electric Appliance Company decided to erect a modern building that would be a credit to the company and a modern establishment for an electrical supply jobber, with the above result.

affiliated with the Electric Appliance Companies of Chicago, Dallas and New Orleans, and cover the states of Arizona, Oregon, Nevada and California. C. C. Hillis is general manager.

The Western Electric Company maintains jobbing houses in San Francisco, Los Angeles, Portland, Seattle and Salt Lake City. W. S. Berry, with headquarters in San Francisco, is in charge of Pacific Coast sales.

These are typical jobbers of the West, and all of them have the true vision of the West, which is really nothing but the idea of the hardy pioneer brought up to date. Instead of braving the perils of the desert and the dangers of the unknown trails

over the mountains, these men have looked forward to the day when the West would be a group of true electrical homes and when the Pacific Coast would be outlined by a transmission line stretching from Canada to Mexico. With this vision held before them these men have striven toward that end, formulating a policy based on the Golden Rule and "live and let live." This vision is now fast becoming a reality and the jobbers, true to their ideals, are looking still farther ahead and planning a bigger vision that will not have any geographical boundaries, but will strive to carry the big mission to the rest of the men of the trade through the Electrical Supply Jobbers Association.



#### PACIFIC STATES ELECTRIC COMPANY BRANCHES

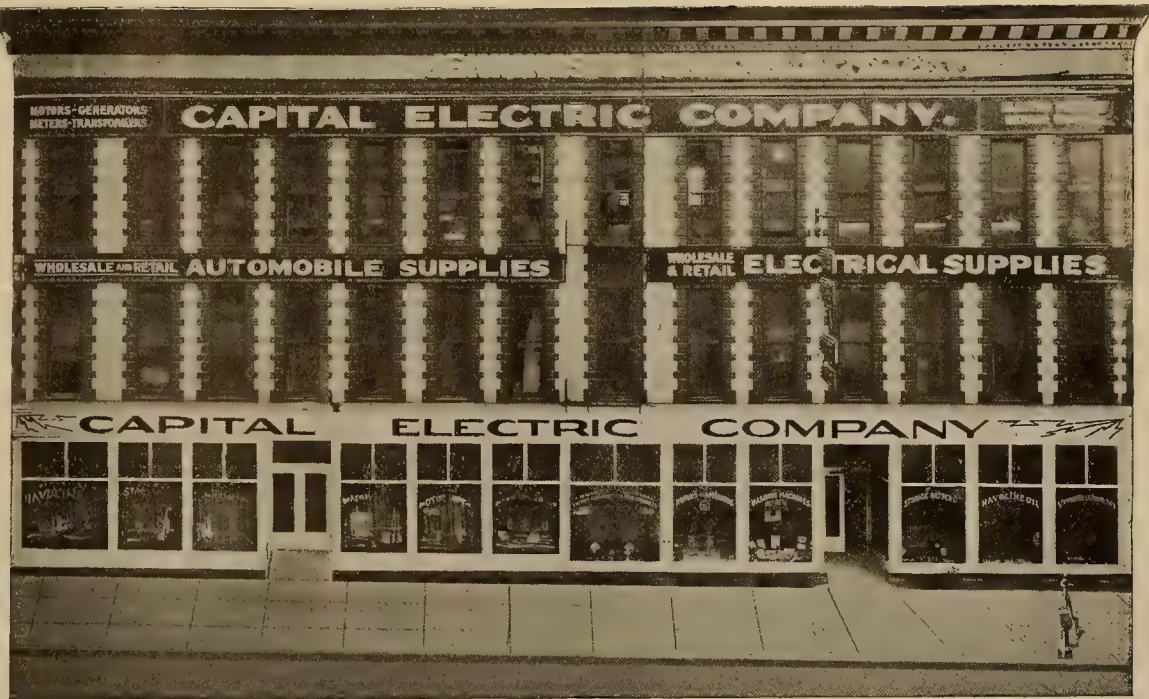
Upper left: Seattle Office  
Upper center: San Francisco Office  
Upper right: Los Angeles Office  
Lower left: Portland Office  
Lower right: Oakland Office

Besides the offices shown, the Pacific States Electric Company has branches in Spokane and Tacoma and large warehouses in Seattle, Portland, San Francisco and Los Angeles. This chain of stores covering the entire Pacific Coast insures the customers of the Pacific States Electric Company the best possible service.



# CAPITAL ELECTRIC COMPANY OF SALT LAKE CITY

One of the few electrical jobbing firms to publish a house organ is the Capital Electric Company which puts out each month "The Generator," distributing it to the central stations, dealers and industrial plants in its territory. This territory embraces the intermountain district. The company maintains a branch in Butte, Montana, under the name of the Butte Electrical Supply Company.



## Office Records—Their Filing and Indexing

BY IRENE WARREN

(Filed material is constantly being needed for reference, and the fact that it is consulted and borrowed by various individuals and departments in the organization necessitates a strict system of charging, similar to that used in libraries. This point is taken up in the following article, the eighth of the series, by the director of the Chicago School of Filing and Indexing.—The Editor.)

### THE USE OF THE FILES

Most firms keep letters, invoices, bills, and other records from three to ten years. The occasional reference to the old files is extremely important, but of far greater importance is the current use of the files and all systems should be planned with this in view.

The competent file clerk aims to get every paper into the files as quickly as possible and to keep all papers there that are not in actual use, so that any one needing information from the files may get it quickly.

### Regulations

There are three distinct types of questions brought to the filing department: the request for (1) a paper needed in verifying a point which takes but a moment's time, (2) a paper which needs to be studied somewhat longer—five to ten minutes, possibly, and (3) a paper which must be taken back to the borrower's department and kept for considerable time, perhaps a week.

The loan desk or charging desk in the filing department is placed opposite the entrance, and if there are many references to the files, one or more persons are assigned the duties of loan desk attendants. A small table is also placed near the door for those who wish to consult papers for a short time. A railing separates the borrowers from the filing cabinets. It is never advisable to let them get papers out.

Every filing department should have regulations for the users of the files so as to avoid misunder-

standings. The following regulations are in use in a large manufacturing plant:

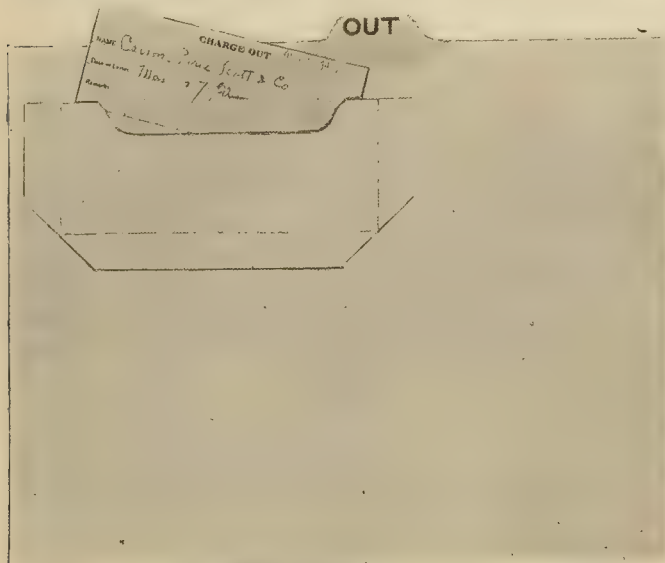
### REGULATIONS FOR THOSE USING FILES

1. No one not an employe of the Filing Department may have direct access to the files during regular working hours, 8:30-5. After closing hours, any papers drawn out are to be placed in baskets provided for this purpose on the charge desk. No papers are to be replaced in the files.
2. All requisitions for material on file must be specified in writing on blanks provided for that purpose. Each department has been given such blanks.
3. Correspondence charged to one person may not be transferred to another except through the Filing Department.
4. File clerks shall not be responsible for delivering or "running down" material not on file within the department.
5. Collections of material to be filed from the various departments will be made at 9:00 and 11:00 a.m. and at 2:30 and 4:00 p.m. Messengers from Filing Department will call and as far as advisable, all miscellaneous deliveries shall be avoided. (Time of collections will be changed if other hours are found more convenient.)
6. Material collected from each department will be kept in separate containers until inspected, and if any article lacks stamp or number, or for any other reason should not be ready for filing, said article will be returned to the department from which it came for addition or revision.
7. Any correspondence or original orders received in the Filing Department pinned together will be pasted together at the upper left hand corner. If this is not satisfactory for certain correspondence or orders, please so state, and give reason for not pasting when sending in material. (Pins take up too much room in the file and their use is to be avoided whenever possible.)
8. It shall be the aim of the Filing Department to give, at all times, the most efficient and courteous service it is possible for human agents to render, and we ask the co-operation of all departments that we may attain this end.



### Charging Methods

The best method for charging papers is to use an Out-guide with a pocket at the top into which the charge slip is placed. The Out-guide may be used over and over again. It is placed in the file exactly where the papers are removed. The three-by-five-



Specimen of the Out-guide used as a record of material borrowed from the files. The charge slip is placed in the pocket at the top of the guide.

inch slips are made into pads and kept in each department. The borrower fills in as much as he can, signs the slip, and the file clerk completes the charge. The information given on the charge slip must be arranged in accordance with the system used. For an alphabetic name file the following plan is used.

- (1) **Description of item.**
  1. Letters, bills, invoices (check item wanted).
  2. Name of writer or customer.
  3. Subject of letter (give in one or two words).
  4. Date of letter.
- (2) **Description of borrower.**
  5. Borrower's name.
  6. Borrower's department.
- (3) **Transaction.**
  7. Date borrowed (on upper right hand corner of slip).
  8. Date renewed.
  9. Date for return.

It is a good plan to paste or pin to each item used a bright colored slip bearing the following instructions:

#### NOTICE

This correspondence is charged to your department and must be returned to the files promptly. Under no circumstances are these papers to be transferred to any other department except through the file-room.

#### Checking Up Borrowed Material

Every day or every few days, as seems advisable, the file clerk lists those papers not returned on time and notifies the borrowers by phone or on a memo designed for that purpose. It is customary to renew papers for the same length of time as the original loan. The return slips are counted each day and statistics kept which are valuable in showing the growth of the department. The whole plan of lend-

ing business papers from the filing department is very similar to the plan of lending books to patrons of the public library.

Frequently employers say they are too busy to wait to have material they want to borrow charged. But these are the concerns that allow high salaried men to wait hours and sometimes days for the papers they need, and when papers are lost, invent the best answer they can to the inquiry.

Many filing departments have hundreds of calls a day for papers. The aim is to answer each request promptly and courteously.

## Western Ideas

WINDOW DISPLAY PICTURES are estimated by some to be more valuable than any other publicity factor. The window display is indeed the shop's one tangible introduction to the public. Here every passer-by sees exactly the type of goods handled by the shop and further gets a visual impression of the way in which it is handled. Since the window, above all else, expresses the personality of the store it should certainly be capitalized in every way. Most effective of all has been found the well-taken picture which can be used as an advertisement in the daily papers, in shop booklets or on posters.

Further, no dealer should consent to presenting any but the best picture of his window to the public. If he is wise he will hire a professional commercial



The window display of the Sterling Electric Company of Sacramento, California, which shows how a pleasing effect may be obtained at little expense if good taste is used in arrangement. The desirability of displaying the merchandise on different levels can be seen. In this way a spacious effect is obtained even though the window contains a large number of articles. The small curtain across the back of the window is a simple yet artistic way of setting off the window from the rest of the shop.

photographer for the purpose whenever possible, and will make sure that the rest of the store is made dark so that the window will stand out by itself. Night time is therefore the best time for taking the picture. Progressive dealers have found that additional customers come to their shop because of extensive publicity of their effective window displays, and so have decided that every effort should be expended in improving their arrangement and lighting, and in making them as varied and interesting as possible.



# The Commercial Instinct

BY S. M. KENNEDY

(The constructive imagination which creates opportunities is one of the most invaluable business assets. The general agent of the Southern California Edison Company here analyzes what he calls the "commercial instinct" pointing out the unlimited opportunities which lie open to the resourceful electrical salesman. This is the eleventh article of Mr. Kennedy's series.—The Editor.)

While there is little resemblance between a central station business and that of a mercantile establishment, yet, in the development and up-building of each business the services of a certain class of men become necessary. In the central station business, skilled electrical and mechanical engineers are required to design and construct the plants, and plan and erect transmission and distribution lines—but as a rule, these same engineers know little about marketing the product and selling the service of the central station. The work falls upon the commercial engineer, the sales engineer, the plain salesman or whatever he may be termed—but at any rate, he



Special lighting for the large steam table of a cafeteria. It should be the aim of the salesman of electrical energy to build up as many types of load for his company as possible so that the central station may operate continually at the highest efficiency.

must be a man who has commercial training with an instinct for finding business, and the sagacity to secure it. Some men innately have the commercial instinct. In some men it may be developed, and with others neither education or exhortation, neither precept nor example will ever make them realize how to see and how to sell. While it may be true that it is impossible to develop this commercial instinct in some men, it may also be true that other men may be born with an abnormal amount of it. An instance of this may be found in the story of a man who one day rushed into a store and said to the clerk, "Quick, a quarter's worth of carbolic acid!" "This is a hardware store, not a drug store," explained the quick-witted salesman, "but we have a fine line of ropes, revolvers and razors." Again it is possible where in some instances the commercial instinct is developed,

that there may be some over-development, along calm and deliberate lines. A certain printing and engraving establishment in Buffalo one day received a notice from one of its customers in the banking business in a middle west town, containing the information that its president had died. The notice was turned over to a clerk with instructions to send a suitable reply. In due course the bank received a letter from the Buffalo establishment which read as follows: "We are greatly pained to learn of the loss sustained by your bank, and extend to you our heartfelt sympathy. We notice that the circular you sent us, announcing Mr. Brown's death, was lithographed by a Chicago house. We regret that you did not allow us to figure on this job. The next time there is a bereavement in your bank, we shall be glad to quote you on lithographed circulars, and feel confident that we can give you better work at less cost than any other house in the business. Trusting we may soon have an opportunity to quote you prices, we remain, with profound sympathy,—” This man's idea of taking advantage of every opportunity may have been carried a little too far, but he certainly had the commercial instinct fully developed.

## Cumulative Results

The manager of a utility company knows that the fundamental basis for selling his product is to get the public confidence. The confidence must be



Interior lighting of a new restaurant. In theatres and hotels and all places where decorative lighting is a special feature, exceptional opportunities are offered to the electrical salesman.

mutual between buyer and seller; after that it is only a question of merit—that is, the value of the commodity offered and the ability of the salesman to convince the buyer that he should place an order.



In the central station business, the salesman has a wonderful story to tell to the prospects for service. There is a great difference between the results obtained by the salesman for a mercantile establishment and those obtained by the man who sells electric service. For the merchant, when a sale is made, and the money for the goods purchased is paid over, the transaction is closed. But for the electric company the sale of service, be it light, heat or power, the sale of a lamp, a motor or a current-consuming appliance is just the beginning of business—for month after month and year after year, the current-consuming device or its successor, be it lamp, motor or appliance, will continue to produce an income for the company. Consequently, the electrical salesman's work cannot be measured by the day, for it is cumulative, and the results go on forever.

#### Visualizing Business

The electrical salesman, with the commercial instinct, sees opportunities for business in every direction. To the merchant he points out the advantages of electric light for displaying his goods, for keeping his ceilings and store clean, by an absence of smoke and smut; for reducing the heat in summer, and permitting good air at all times; for improving the decoration of his windows, and keeping them attractive, winter and summer, so that the public may see what he wishes to display. And then the salesman shows the merchant a score of electrical devices which may be operated to advantage inside his store, to lighten the work of his employes and help him make money. Finally the salesman takes his merchant friend to the door, and points out the location where an electric sign will work for him while he sleeps; how he can burn his name and business into the public mind—and how the electric company will take care of the sign, turn the current on and off at the proper times and relieve him of all responsibility in the matter. The power user has much to learn and to a great extent the salesman with the commercial instinct must be his instructor. The salesman drops into a factory, in connection with his daily work of spreading the gospel of electricity. Probably this factory is in a crowded part of the city where space is valuable and rents are high. What does he see in connection with the operation of the private plant? Probably fifty per cent of the power generated, wasted and dissipated in shafting and belting before the machines commence to operate. Probably ten times as much space given up to engines and boilers, as would hold a complete electrical equipment. Probably twice as much money invested in the power end as there should be, and, consequently, twice as much interest, taxes and insurance and four times as much depreciation continually piling up. He probably finds plenty of noise, dirt, smell and inconvenience, to say nothing of high priced skilled labor to keep the decrepit wheels of his private plant moving. Little by little—by explanation and by exhibition, the salesman can show that electrically driven machinery represents economy of power, by means of direct connected units; that motors occupy little space and may be taken off the floors and stuck on the walls

and ceilings; that they cost half the price of other kinds of power equipment; that their maintenance and depreciation is a matter of little consideration; and finally, that they are clean, noiseless, convenient and reliable, and do not require skilled labor to operate them. To the manufacturer who has had constant worry keeping his plant going and his factory running, this story sounds like sweet music in his ears, and the skilled salesman sooner or later gets the order he is after.

#### Transforming a Home

When the electrical man with the commercial instinct has an opportunity to turn himself loose in the modern home he speaks with the tongues of men and angels. At every turn he can make a suggestion that will help the customer and benefit his company. There is some electrical device for every room which will lighten labor and ease the strain of daily life. The kitchen has many electric cooking appliances, and other devices for cleaning, polishing and dishwashing. The laundry has the electric washing machine and electric irons, mangles and dryers. The dining room has electric table accessories such as toasters, percolators, tea-urns and chafing dishes; the living room has eye saving electric reading lamps, fans, foot warmers, cigar lighters and motors on the piano and organ. The bedroom has electric heating pads, water bottles and water heaters. The bath room has electric shaving mugs and curling irons—while the work of the vacuum cleaner and other sanitary appliances is in evidence in every direction. In all his work the man with the commercial instinct in selling electric service has no more convincing argument than that of saving time. Electric service saves time, and to save time is to lengthen life. In this age of hurry, time is one of the most valuable assets of the business man and the women in the home, and a proposition that will save time is one that will invariably receive careful and eager attention.

#### Diversity of Load

To the man with the commercial instinct, the electric company looks for the up-building of the load factor as well as the load. It is an easy matter to explain the difference between load building and load factor building, but not always easy to tell how to obtain a better load factor when building up the business of a central station company. In most communities evening peak will come without much effort, but not so with day load and early morning load. In order to build up a really good load factor, there must be a great diversity in the classes of service supplied, and for an electric company to attain a really high load factor there must be a great diversity in load, or else relatively large blocks of power must be sold for continuous use. The man with the commercial instinct knows of no class of business that would not be better for using electric service, and by getting all classes into line, and selling the limit each class can consume, he obtains the needed diversity of load and builds up the load factor on his company's system. This can be done only by extensive and intensive development, mainly brought about through the personal efforts of the man with



the commercial instinct, in constantly explaining and demonstrating the undeniable advantages derived from the use of electric service—"To every man according to his necessity—for every man according to his need."

### Creating Opportunities

The problem for the central station manager is to develop the commercial instinct in all departments of his organization, and not look for it alone in his new business department or among his salesmen. There is no kind of business that is as susceptible of development through suggestion as that of the electric distributing company. The clerk at the counter receiving an application for service can inquire if the applicant has this appliance or the other and point out where it may be seen and purchased. The cashier or his assistants may easily suggest that the customers making payments look at some new electrical device which may be on exhibition in the office display room. The man who comes in to make a complaint, if properly handled, may go away with a determination to buy some other current consuming apparatus just because its advantages were carefully explained by the clerk who received his complaint. The collector has a splendid opportunity for he talks to scores of customers daily. The trouble man who goes into the home to make repairs has a rich field in which to sow the seed that arouses interest, and develops inquiries for greater service. There are no limits to where suggestions may be made for there is no consumer using so much service that he cannot take some more to his own advantage.

### The Personal Element

The man with the commercial instinct fully developed usually knows the value of attention to his personal appearance, and how much depends upon the impression his appearance makes when calling upon prospects. In the central station business, a man representing an important company has a great responsibility for the magnitude and importance of his company is often measured by the appearance of the representative. The man with careless apparel and unshaven face always places himself at a disadvantage, and, of necessity, the company he represents also. The world rarely puts a higher price upon a man than he places upon himself, and frequently it marks him down from his own estimate. Carelessness, untidiness, and disregard for the conventionalities have relegated many a man to the bargain counter. There are only two kinds of men who can afford to disregard their personal appearance—the very rich man and those without ambition. However, if either of these classes get into the central station business and remain untidy, their careers in that industry would necessarily be short. The successful commercial man also knows the value of courtesy and enthusiasm—in reality it is the greatest factor in his success. With his enthusiasm he will at all times work to convince the people that his company is operating in their interest—and will do everything possible to render the business relations between the company and its patrons, pleasant, agreeable and profitable to both. The more people

the commercial man can get to think favorably of him and his business, the faster will the business develop and increase. Then, mixed with courtesy and enthusiasm, there is a tremendous asset in a pleasant smile, and the man behind the pleasant smile has a tremendous advantage—

"The thing that goes the farthest towards making life worth while, That costs the least and does the most, is just a pleasant smile. It's full of worth and goodness too, with hearty kindness blent, It's worth a million dollars, and—it doesn't cost a cent."

### Recognizing Friends

The central station man with the commercial instinct has one friend for whom he has the highest regard—that is the customer. There are some men in the industry who seem to think the central station business would be simply irresistible, if it were not for the customer. Such men look upon an applicant for service as an objectionable nuisance; a request for information about some electrical appliance as simply a bore, and a desire to pay an electric bill something that should be barely tolerated. Such men, however, are being gradually eliminated, either by the process known as "the survival of the fittest" or by assassination at the hands of irate customers. But the man with the commercial instinct knows that the customer is the best friend he has. This friend patiently listens to wonderful tales of a light that is more fascinating than that which gleamed from Aladdin's lamp—of the marvelous, health-inducing and sanitary heat, and of the mysterious power, which works quietly and effectually in daylight and darkness. This friend signs all applications for various kinds of service as they are presented to him, orders all sorts of current-consuming devices and appliances to increase his consumption, sits up nights to use more freely the commodity supplied, and at the end of the month, insists upon paying good money for the most intangible product ever sold or distributed. The man with the commercial instinct recognizes that customer as the one thing needful to him and the company, and that the customer should always be treated with such courtesy, deference and tactful politeness that he will think and believe doing business with him and the company he represents a real pleasure.

To the engineer, is is a great source of satisfaction to have the honor of aiding substantially in the construction of some immense power plant that harnesses and tames a mountain torrent and delivers its energy in a commercial form in some center of population, maybe a hundred or miles away. But the satisfaction and pride of the engineer is not greater than that of the man with the commercial instinct who goes out and finds a market for that power. Through his untiring efforts it is advantageously used every hour in the day, thus producing earnings which justify the investment represented in the installation. At the same time, cheerfulness, health, hope and happiness are brought to the many who have been persuaded to accept the magic service of the electric company through whose foresight and enterprise such service has been made possible.



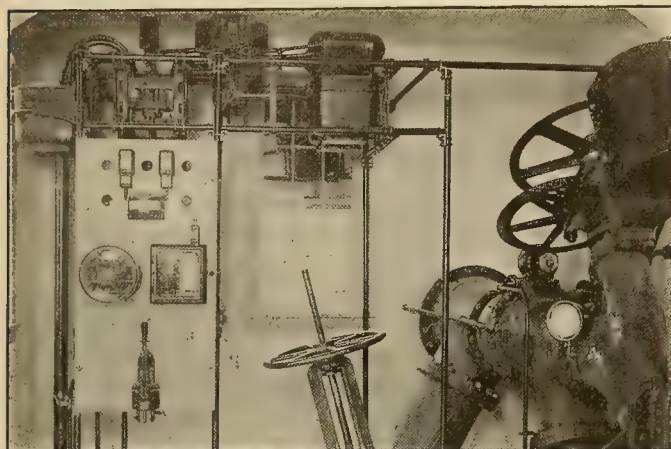
# Remotely Controlled Hydroelectric Synchronous Generators

BY CHARLES H. TALLANT

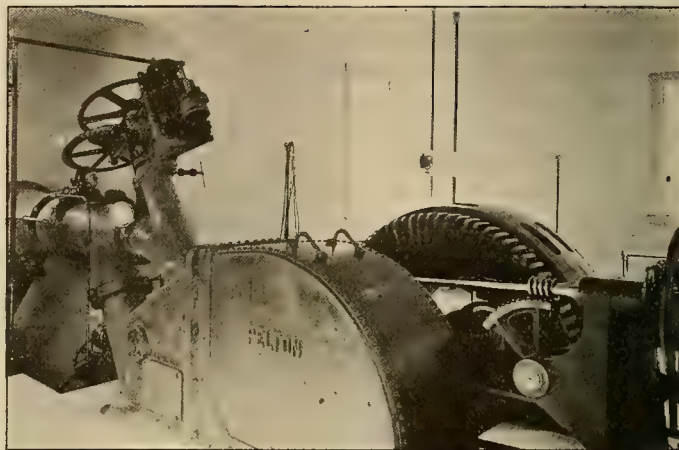
(Typical of present day development of hydroelectric installation on the Pacific Coast, is that of the automatic installation at Ontario, California, by the Ontario Power Company. This is the second of its kind to be installed in the world, and, as a consequence, commands unusual interest at the present time.—The Editor.)

Semi-automatic hydroelectric induction generator plants and remotely controlled induction generator plants, while not in general use, have been given frequent consideration. It remained for the Ontario Power Company, California, however, to install a remotely controlled synchronous generator

adjustable contact limit switches in the mechanism of the remotely controlled plant are responsible for the operation of the motors but do not themselves directly affect the operation of the motors. The contact switches act on relays and contactors on the switchboard panel, and these in turn cause the



Partial view of the motor operated needle valve and view of the main panel mounting the line switch and meters.



Interior of remotely-controlled hydroelectric generating station, showing generator, water-wheel and limit switch with cover removed, for controlling one of the water-wheel needle valves.

hydro plant as a very new idea in central station practice.

The plant in question is known as Ontario Plant No. 2, located in San Antonio Canyon, and normally takes the entire flow of the stream in this canyon without storage capacity. The plant is installed above two other plants on the same stream and in essentially a by-pass around some low falls and rapids in the head of the stream. All of the water of the stream is required for the two plants below, one of which is Ontario Plant No. 1, and this fact has a decided bearing on the design of equipment for Plant No. 2.

The equipment of Plant No. 2 consists of one single Pelton impulse turbine, overhung from a Westinghouse 500-kva., 50-cycle generator, with direct connected excited. The turbine is rated at 550-hp., 290-ft. head, and receives water through a duplex needle nozzle. A third separate nozzle is used as a by-pass around the unit in order to permit uninterrupted flow to Plant No. 1, in case the upper plant is shut down. All three of the nozzles are operated by electric motors provided with interlocking limit switches, in order to maintain fixed relative action between the three. This arrangement is made for the purpose of maintaining maximum efficiency at all degrees of load and water consumption. Governor operated jet deflectors are also provided for emergency control and speed regulation.

Plant No. 2 is completely controlled from Plant No. 1, situated three and one-half miles down the canyon, by means of a double throw switch. The

motors to operate. The various operations occur in proper sequence in the following order:

When the plant is operating on full load, both power nozzles are full open and the by-pass nozzle is closed. If it is desired to reject all of the load, the duplex switch in Plant No. 1 is thrown to the "To Close" position, and the first action is to close the relay which starts the closing of the upper power nozzle. After a certain predetermined interval a contact switch on the upper nozzle acts to close a relay, which starts the closing of the lower power nozzle. Then for a certain interval both nozzles are closing together. On reaching a certain point of closing, which corresponds to a predetermined minimum stream flow, a contact switch on the lower nozzle acts to close a relay, which effects the opening of the by-pass nozzle. Then for a short interval both power nozzles are closing and the by-pass nozzle is opening.

The upper nozzle, which starts to close first, reaches the full closed position first, and its limit switch acts to open its closing relay to prevent jamming of the mechanism. By the time the lower power nozzle reaches its full closed position the by-pass nozzle is opened to the predetermined point which discharges the required flow, and the limit switch on the lower power nozzle acts to open all relays and stop all action. Water then flows through the by-pass only and the generator is unloaded and removed from the line.

When it is desired to put the plant on to the line, the duplex switch in Plant No. 1 is thrown to



the "To Open" position and the sequence of operations is started, but in the reverse order, thus:

1. By-pass closes and lower power nozzle opens.
2. Upper power nozzle opens with by-pass still closing, and lower power nozzle opening.
3. By-pass nozzle reaches full closed position with both power nozzles still opening.
4. Lower power nozzle reaches full open position and its limit switch acts to stop all action, both power nozzles being open and the by-pass nozzle closed.

The operation of the plant is not limited only to the full on or off positions, as any position between may be reached and held by the manipulation of the central switch in Plant No. 1. This is a necessary provision to permit the synchronizing of Plant No. 2 with Plant No. 1, and to regulate for different loads or stream flows.

Synchronizing is accomplished altogether by the remote control of the power nozzles, the synchroscope and main generator switch being on the panel with the nozzle control switch in Plant No. 1. A Tirrill regulator is installed at the upper plant to effect voltage regulation of the remotely controlled unit in the normal way through the exciter field.

It was stated above that the unit in Plant No. 2 is intended normally to use all of the stream flow and the capacity of the unit adopted was based on the maximum normal flow indicated by normal run-off records. Only during periods of flood flow is water allowed to run down the creek channel as well as through the upper penstock. During periods of normal or below normal flow, all water available is passed through the penstock to Plant No. 2, and the water consumption of the unit is governed according to the water level in the small forebay, this level being indicated at Plant No. 1 by a long distance water level indicator. The water consumption of the unit is regulated to keep the level of the water in the forebay at a fixed maximum point. This obviously results in a wide seasonal variation in the plant output during the year.

Fourteen conductors are used between Plant No. 2 and Plant No. 1 and consist of the following: Three main transmission wires, three transmission wires for carrying power to the control motors, three wires for the control circuit, three wires for the long distance water level indicator, and two telephone wires.

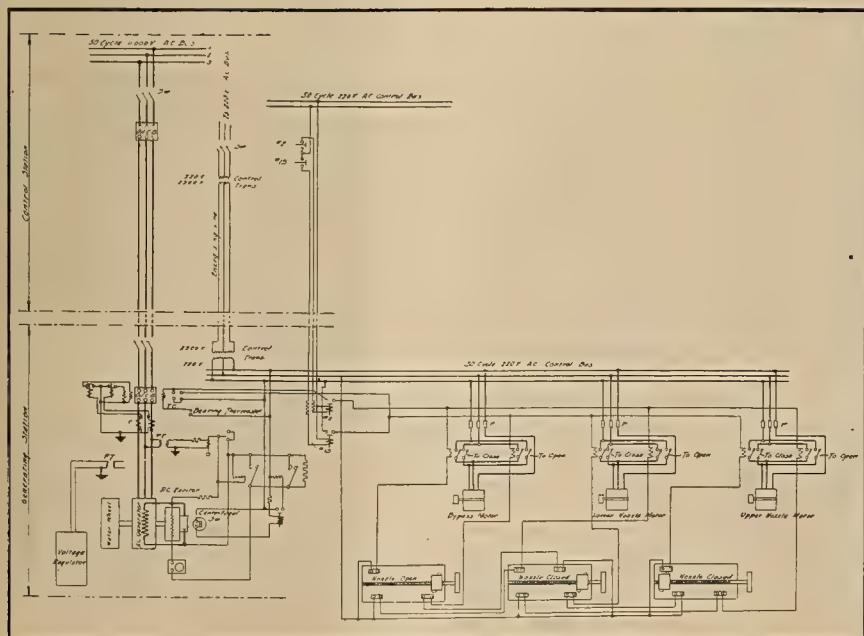
Two switch panels are provided in Plant No. 2. One is for the main transmission circuit and contains an oil circuit breaker with overload trip, an integrating and a graphic wattmeter and a voltmeter.

For the protection of the unit proper, in addition to the overload trips, relays are provided for the operation of all of the other relays, to completely shut down the unit and to open the by-pass in case of over-voltage, low-voltage or excessive bearing temperatures. If the unit is shut down for any of these causes, it is necessary to reset the relays manually, before the plant can again be put in operation. A centrifugal switch is also provided to prevent the operation of the low-voltage relay when the unit is started from rest, normally.

In Plant No. 1 a single switch panel is used for the control of the upper plant. It contains an oil circuit breaker with overload trip, ammeters and wattmeters, the two-point water control switch, the long distance water level indicator and plugs for the voltmeter and synchroscope connections.

The design contemplates the control of all of the operations of starting, synchronizing, building up load, etc., from Plant No. 1. No regular attendant is on watch at the upper plant and only periodic visits are made to the plant for daily inspection, oiling and infrequent adjustments of the voltage regulator. The overload trip in the upper plant is purposely set higher than the trip at Plant No. 1, so that it will only operate in case of line trouble between the two plants.

The several months of operation under complete remote switch control since the plant was put in service have shown the system to be sound and the equipment completely satisfactory.



Wiring diagram showing scheme of relays for progressive operation of nozzles and other devices. All of the remote control is exercised through three wires running between Plant 1 and Plant 2. It is to be noted that part of the control devices operate on closed circuit and part on open circuit and that a.c. is used for control circuits.



# The Hydraulics of Oil Pipe Lines

BY W. F. DURAND

(Long have engineers desired a general equation that might be used in computing pipe line characteristics for the transmission of air, water, oil or any other liquid. Here is a masterly contribution on this subject by W. F. Durand, professor of mechanical engineering at Stanford University, and an engineer of international reputation. This should add greatly to our present knowledge on this important subject.—The Editor.)

The purpose of the present paper is to call attention to the fundamental problem presented by the flow of viscous liquids in pipes and to note the extent to which existing information may be made to furnish the data necessary for a reasonably satisfactory treatment of actual problems, especially as they arise in connection with the design and operation of oil pipe lines.

We first inquire as to the characteristics or factors which will be determinative in any given problem of pipe line flow with a viscous liquid. It should be noted that, for simplicity, the line is assumed to be horizontal. The changes necessary to allow for differences in gravity level are readily made in accordance with familiar hydraulic principles.

It seems clear that the following is a complete census of all characteristics or factors which can be considered determinative in a problem of this character.

- (1) Viscosity of liquid ( $\mu$ ) (absolute units).
- (2) Density of liquid ( $\sigma$ ) (pounds per cu. ft.).  
These two characteristics define the liquid in a mechanical sense.
- (3) Diameter of pipe (D) (feet).
- (4) Length of pipe (L) (feet).
- (5) Roughness of pipe surface.  
These three characteristics define the pipe in a mechanical sense. For roughness we have no method of direct measure and no symbol.
- (6) Velocity of flow ( $v$ ) (feet per second).  
This is a characteristic of operation. To these we must add
- (7) Gravity ( $g$ ).  
This determines the field of gravitational force within which the phenomena of pipe line flow have their being.  
Viewed as a resultant of the interaction of the preceding seven factors we shall then have:
- (8) Loss of head (h) (feet).  
This is, in effect, a measure of the pressure difference required between the two ends of the line in order to insure continued steady motion flow under the conditions assumed.

## Fundamental Relation of Factors

If then we are agreed that the first seven of the above factors are all that are involved in the determination of the loss of head No. (8), and if we further agree to neglect variation in roughness, or otherwise if we agree that, for the moment, we are dealing with a standard or uniform quality of surface, then an application of the theory of dimensions\* gives the following relation:

$$h = \left( \frac{L}{D} \right) \left( \frac{v^2}{2g} \right) \phi \left( \frac{Dv\sigma}{\mu} \right) \quad (1)$$

The significance of this equation is far reaching and it will repay the most careful study on the part of all interested in the subject. The treatment outlined in the following numbered sections will serve to

indicate the more direct and simple applications to the phenomena of the flow of viscous liquids in pipes.

(1) On the basis assumed, viz., that we are dealing with a standard or uniform quality of pipe surface and that all other quantities and factors entering into the problem are represented in the equation, then it follows, with all the authority of a demonstration in mechanics, that the relation between these various quantities is of the form given in equation (1). This means that this equation is not an approximation nor does it in itself represent a hypothesis or a trial form of relation. The general truth of this relation is susceptible of demonstration with the same degree of rigor as obtains with any proposition in mathematical physics or mechanics, resting as it does on the basic principles of physical science.

The derivation in detail of this relation from basic principles is beside the purpose of the present paper and it is furthermore unnecessary since this has been provided long since by other writers and is well known in the literature of the subject.

(2) In order to show the relation of this equation to more familiar forms let us write it again alongside the d'Arcy equation, familiar to all students of hydraulics, thus:

$$h = \phi \left( \frac{Dv\sigma}{\mu} \right) \times \frac{L}{D} \frac{v^2}{2g} \quad (1)$$

$$h = f \frac{L}{D} \frac{v^2}{2g} \quad (2)$$

Comparing these two equations it appears that in this form (1) is the same as (2) if we put

$$f = \phi \left( \frac{Dv\sigma}{\mu} \right)^2$$

That is, we have in (1) simply an extension or development of (2) to the point of defining the coefficient  $f$  as a function of the expression  $Dv\sigma/\mu$ . This means that  $f$  depends on these four quantities and furthermore that it depends on them in such a way that for any one value of the expression  $Dv\sigma/\mu$  there is one and only one definite and specific value of  $f$ , and regardless of the individual values of  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$ , so long as the expression  $Dv\sigma/\mu$  has the given value.

This point is of so great importance that emphasis through illustration will be desirable. Thus suppose some particular combination of values of  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$  gives a value of  $Dv\sigma/\mu = 6,000$ . Then cor-

\*See among other references, Buckingham, Transactions Am. Soc. Mechanical Engineers, Vol. 37, p. 263.

One advantage of the expression  $Dv\sigma/\mu$  is that when the individual values of  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$  are expressed in any consistent absolute system of units (foot, pound-mass, second; or centimeter, gram, second) the value of the expression remains the same independent of the system of units employed. This is commonly expressed by the statement that  $Dv\sigma/\mu$  is a dimensionless expression.



responding to this value 6,000 as argument will correspond a value of  $f = \text{say } .036$ . Then no matter what other combination of individual values  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$  we may have, so long as the value of  $Dv\sigma/\mu = 6,000$ , so long shall we have the value  $f = .036$ . Stated again otherwise, the value  $f = .036$  is applicable to all possible combinations of individual values  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$ , so long as their combination in the form  $Dv\sigma/\mu = 6,000$ .

In particular it should be noted that these factors may belong to the same or to widely different liquids. It is only necessary to know the values of the defining characteristics  $\mu$  and  $\sigma$ . Thus a viscous oil flowing with a high velocity in a large pipe may give the same value of  $Dv\sigma/\mu$  as water flowing with a low velocity in a small pipe. In such case, then, the value of  $f$  should be the same. This does not mean, of course, the same values of  $h$ , since the effect of the other factors (specifically  $v^2$ ) will be to give a much greater loss of head  $h$  for the viscous oil than for the water.

Again, the general laws for the flow of gases and vapors are entirely similar to those for liquids. Hence the same general relation holds for gases and vapors as well as for liquids, or generally for all fluid substances. It is therefore only necessary to know the value of the defining characteristics  $\mu$  and  $\sigma$  in order to assimilate together in one expression the laws of flow for liquids, gases and vapors, and thus generally for all flowing substances.

Thus again and broadly, no matter what the substance, so long as we know its viscosity and density; no matter what the size of conduit so long as we know its size; no matter what the velocity so long as we know its measure, we may find a value of  $Dv\sigma/\mu$  and to this value should correspond one and only one definite value of the coefficient  $f$ .

(3) From this it immediately follows that if, through a series of actual measurements, experimental values of  $f$  are obtained for a graded series of values of  $Dv\sigma/\mu$ , and if such experiments are extended over the entire working range of values of  $Dv\sigma/\mu$  and at reasonably close intervals, then we may, by the usual graphical process, plot such data and draw in a fair curve through or among such experimental spots.

Such curve should then give a graphical expression for the general relation between  $f$  and the argument  $Dv\sigma/\mu$ .

(4) Such a curve, once in hand and accepted as reliable, we should then have no further need for experimental determination of values of  $f$ —always remembering the assumption of a standard quality of pipe surface. No matter what individual values of  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$ , the particular case may present, we should have only to find the resultant value of  $Dv\sigma/\mu$ , go to this point on our axis of abscissæ and read off the corresponding value of  $f$ ; or otherwise in case the data were presented in tabular form, enter the table with the value of  $Dv\sigma/\mu$  as argument and draw therefrom the value of  $f$  (either directly or by interpolation) in the usual manner with the use of tables and tabular data.

The value of  $f$  once known, we may then proceed

immediately to find  $h$  by the familiar d'Arcy equation as in (2).

(5) We come next to the practical question, does such information exist? Are we now, on the basis of experimental work, in a position to prepare a chart or table setting forth the general relation between  $f$  and the argument  $Dv\sigma/\mu$ —always for a standard quality of pipe surface?

The answer is largely in the affirmative. The chief limitations arise from the lack of any standard for quality of surface. We have no scale for roughness nor do we have any direct basis for the measurement of this characteristic as in the case of pipe diameter or velocity of flow.

Large numbers of experiments, however, have been carried out on the flow of various substances such as air, gas, water, oil, etc., in tubes and pipes designated as "smooth" or "new and clean." In so far as the quality of surface involved in these experiments may be assumed to have been fairly uniform, such experimental data should fall in line for the provision of a standard series of values of  $f$  as indicated above. We cannot define or specify roughness but we can define, at least in a commercial sense, a smooth surface as one without roughness in degree sensible with regard to its influence on the values of  $f$ . If therefore we should find by plotting results from a large number of such experiments on different substances and with widely varying values of  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$ , that the resultant values of  $f$  plotted on an abscissa  $Dv\sigma/\mu$  all fall on or near a smooth continuous curve, a curve clearly representing a law or relation between physical quantities, we should then be justified in assuming that the data thus in hand do represent in effect the results from a series of pipes or tubes or conduits with a sensibly uniform quality of surface. If slight variations one way or the other are noted, if slightly different values are found for the same value of  $Dv\sigma/\mu$ , or if differences between values nearly the same are somewhat too great to be reconciled with the obvious general trend of the curve, then we may naturally conclude that we have in evidence the influence of slight variations in the quality of the surface. If again we should find certain values which lie consistently higher than the general trend of values, while themselves following the same general slope or form of graphical law, we shall naturally conclude, especially if individual groups of such values belong, each to one particular pipe or conduit, that we have in evidence the influence of a degree of roughness in a given pipe distinctly greater than the general average for "smooth" or new pipe values, and thus giving by the extent of increase of values above those for smooth or new pipe, a form of measure of the roughness as compared with what we may term "commercially smooth" pipe.

Actual examination of the data in hand reveals all of these characteristics. There is a sufficient amount belonging to pipe which may be rated as commercially smooth, to give a good indication of the general run of values for  $f$  for such pipe and extending over a wide range of values of the argument  $Dv\sigma/\mu$ .



Suppose a smooth curve drawn through and among such values, giving in this manner the best indication to be drawn from existing data, of the values of  $f$  on the argument  $Dv\sigma/\mu$  for what may be termed commercially smooth pipe. We shall denote values of  $f$  given by such a curve as standard or normal values.

There are also to be found, lying above the curve of standard values, large numbers of spots which obviously belong to cases of rough pipe and with degrees of roughness, as indicated by the values of  $f$ , ranging from barely appreciable indications up to values fifty and seventy-five per cent and even more, in excess of standard values.

(6) There is one exception to the statement that clear indications are found for a general curve of values of  $f$  plotted on values of  $Dv\sigma/\mu$ . This is found in the vicinity of values of the argument  $Dv\sigma/\mu$  close about 2,000 or between 2,000 and 2,500.

The general character of the curve of  $f$  is shown in Fig. 1.

From very small values of the argument up to values approaching 2,000 we find a clearly indicated branch of the curve A B. For values of the argument close about 2,000 or slightly above, the spots are much scattered and give no definite indication of a consistent law. Soon, however, as we pass to larger values of the argument, we find again clear indication of a branch C D. The point C of this branch lies notably above B, implying a sudden and irregular jump in  $f$  close about the 2,000 value of the abscissa. From C the curve gradually and smoothly declines for increasing values of the abscissa, approaching more and more nearly to parallelism with the axis of  $Dv\sigma/\mu$  as larger and larger values of the latter are reached.

Since the actual range of working values of  $Dv\sigma/\mu$  may extend from lower limits of 10 and below to upper ranges of 300,000 and more, it is found convenient to use a logarithmic scale for  $Dv\sigma/\mu$  instead of a natural scale. Fig. 1 is shown with a scale of this character.

(7) Turning again to the two branches A B and C D, the first of these corresponds to the so-called stream line mode of flow; the latter to turbulent flow. It is well known in hydromechanics that a liquid flowing between boundary surfaces, as in the case of a pipe, may exhibit two modes of flow.

In the first the liquid particles follow smooth paths generally parallel to the line of the pipe and without whirls, eddies and contorted motion. Such mode of motion is known as stream line flow.

In the second mode the paths of the liquid particles are confused, comprising eddies, whirls and generally contorted, twisted, turbulent motion superimposed on the general movement of translation along the pipe. Such mode of motion is known as turbulent flow, and the general condition characterized by such motion is known as "turbulence."

Many experiments have been made showing the breaking up of stream line flow into turbulent flow. In such experiments, for example, a colored liquid has been introduced in a thin thread into a stream flowing in a glass tube and as the velocity is grad-

ually increased, a point is found where the coherent clearly defined colored thread suddenly breaks up and disappears as such, the color being generally diffused throughout the mass of turbulent flowing liquid. It is furthermore established by experiment that the combination of conditions which determine this point of abrupt transition from one mode of flow to another is found in the argument  $Dv\sigma/\mu$  and that the value which determines such critical point is close about 2,000. The appearance of this zone of uncertainty and confusion in the distribution of the values of  $f$  on a chart such as that of Fig. 1 is therefore simply another indication of the existence of this double mode of liquid movement and a location of the transition point at or near the numerical value 2,000 for the argument  $Dv\sigma/\mu$ .

(8) Turning again to the branch A B, it appears from mathematical discussion, the details of which we shall not here repeat, that this curve is a rectangular hyperbola of which the equation is

$$xf = 64 \dots\dots\dots (3)$$

$$\text{or} \quad f = \frac{64}{x} \dots\dots\dots (4)$$

where  $x =$  the argument  $Dv\sigma/\mu$  and  $f =$  the friction coefficient as above.

It appears furthermore, from the theory of stream line flow, that the characteristics of such flow, and the resistance opposed thereto, are only in slight or perhaps negligible degree dependent on the relative roughness or smoothness of the pipe. If this is true it follows that experimental values of  $f$  lying within the zone of stream line movement, that is with values of  $Dv\sigma/\mu$  definitely less than 2,000, should lie on or near the curve given by equation (3) above, and regardless of the condition of the pipe surface.

Examination of experimental results shows that there is a marked tendency to realize this condition. Spots indicating experimental values are found, whether for commercially smooth or for rough pipe, to fall very near the hyperbola defined by equation (3), and in general with no wider departures one way and the other than may naturally result from experimental errors.

In one respect, however, there is indication of an influence due to roughness of pipe surface. This regards the point of transition from stream line to turbulent flow. There is some evidence that with rough pipe the break over from one to the other occurs at lower values of  $Dv\sigma/\mu$  than the 2,000 value which marks the vicinity for commercially smooth pipe. There is need, however, for further experimental investigation regarding these matters.

However, with this reservation, it appears that for all values of  $Dv\sigma/\mu$  well below 2,000, whether with commercially smooth or with pipe relatively rough in varying degrees, the value of  $f$  should be given directly from equation (4).

(9) Taking next the branch C D, for values of  $Dv\sigma/\mu$  definitely above 2,000, there is no algebraic expression for this branch and the mode of procedure for such values will include the following steps:



- (a) The numerical value of  $Dv\sigma/\mu$  is found.
- (b) With this value as abscissa (or argument) take from the curve (or table according to the form of the data) the corresponding value of  $f$ . This will apply to commercially smooth pipe.
- (c) If the pipe surface is assumed to be rough rather than commercially smooth, a correction is then made by increasing  $f$ , according to judgment, to allow for the quality of surface, as assumed.

The following table gives values for  $f$  over the usual range for the branch CD and for qualities of pipe which may be taken as "commercially smooth."

TABLE 1			
Abscissa	$f$	Abscissa	$f$
2,500	.0442	30,000	.0238
3,000	.0426	35,000	.0228
3,500	.0412	40,000	.0219
4,000	.0400	45,000	.0213
4,500	.0390	50,000	.0208
5,000	.0382	60,000	.0200
6,000	.0364	70,000	.0195
7,000	.0350	80,000	.0190
8,000	.0340	90,000	.0185
9,000	.0330	100,000	.0180
10,000	.0320	150,000	.0168
12,000	.0304	200,000	.0158
14,000	.0292	250,000	.0150
16,000	.0280	300,000	.0144
18,000	.0271	350,000	.0140
20,000	.0264	400,000	.0137
25,000	.0249	450,000	.0134

- (10) This general method for determining the value of  $f$  involves then the following:

For values of  $Dv\sigma/\mu$  less than about 2,000, a definite value is given by equation (4), applicable to all qualities of pipe surface.

For values of  $Dv\sigma/\mu$  greater than about 2,000, a definite value is given from the curve (or table) for the case of assumed commercially smooth pipe, leaving a correction for roughness of surface to be determined by judgment.

Regarding roughness and its effect on friction head, it is evident, since we are unable to directly measure or numerically evaluate this characteristic, that any allowance for its influence on the friction head must be made as an act of judgment based on the general observed effects of roughness in varying degrees. This must always necessarily be the case

so long as we are unable to numerically evaluate roughness and the most that any method of treatment for the problem can hope to accomplish is to provide a definite procedure leading to a definite result, in so far as the four variables,  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$  are concerned, and then to leave to judgment, applied to the particular case, the correction (if any) due to quality of pipe surface and involving an attempt to compare the actual or assumed degree of roughness with that constituting a "commercially smooth" surface and an estimate of relative increase in the value of  $f$  for the rough as compared with the smooth.

The procedure outlined in the present paper seems to realize this end. By the means indicated, definite values of  $f$  may be found for "commercially" smooth pipe and based on observation and experience as it may accumulate, correction (if required) may be made for any assumed degree of roughness of surface.

- (11) With regard to the determination of a definite value for  $f$ , there is, however, one exception. Close about the value 2,000 for the argument  $Dv\sigma/\mu$  there is, as we have seen, confusion and uncertainty. For a value of  $Dv\sigma/\mu$  falling in this neighborhood there is, therefore, great uncertainty, and the only safe value of  $f$  will be one corresponding to the beginning of the branch CD or a value about .044. All of this, however, corresponds with the facts. Actual conditions here are found to include a wide range of uncertainty and estimates, to be safe, must be made to cover the extreme values.

It results further that this value of  $Dv\sigma/\mu$  should be avoided as an operating condition. By a suitable lowering of the velocity the value may be reduced sufficiently to bring the value of  $f$  over to or near the lower end of the branch AB. This is, in effect, the most favorable point for operation, so far as pipe line resistance is concerned, and so far as may be found practicable, the conditions of operation should be so chosen as to bring the value of

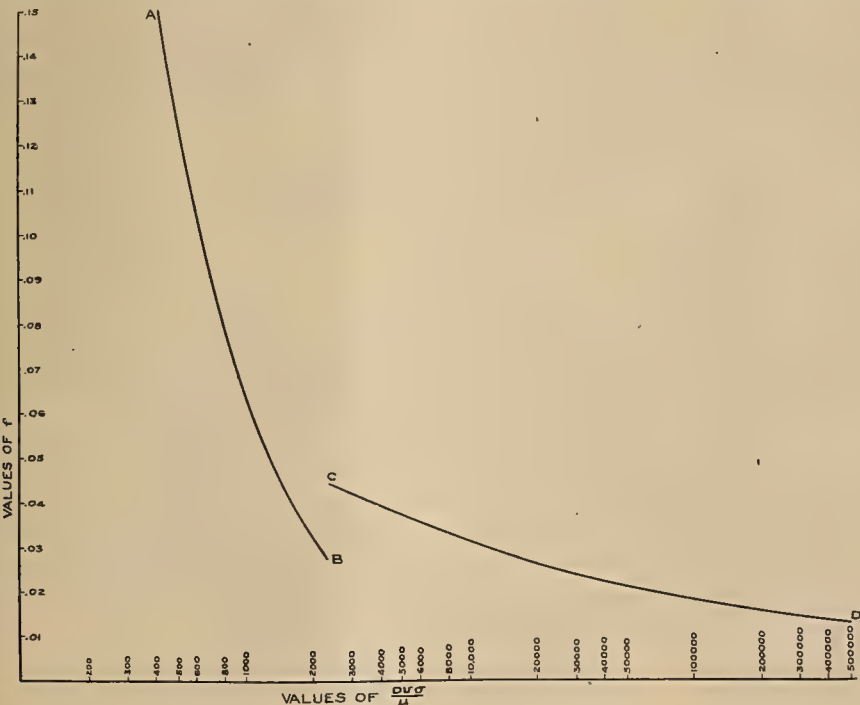


FIG. 1.

This chart is a graphic representation of the above table.  $Dv\sigma/\mu$  represents the diameter of the pipe times the density of the liquid and the velocity of its flow, divided by the viscosity of the liquid. When the value of  $Dv\sigma/\mu$  is less than 2,000 a definite value of  $f$  is given by equation (4), applicable to all quantities of pipe surface. The curve shows a definite value for  $f$  when  $Dv\sigma/\mu$  is greater than 2,000.



$Dv\sigma/\mu$  down in the vicinity of 1,500 to 1,800 or by a safe margin below the critical value of 2,000 to 2,500.

(12) It now remains to note the units, measurements and numerical values involved in determining the four quantities,  $D$ ,  $v$ ,  $\sigma$ ,  $\mu$ .

The fundamental units are taken as the foot, pound-mass and second.

(1) The diameter  $D$  is therefore to be measured or expressed with the foot as the unit.

(2) The velocity  $v$  is to be expressed with the foot and second as units or numerically in feet per second.

(3) Density  $\sigma$  is to be expressed in pounds per cubic foot. We here meet the condition, however, that the densities of liquids, and in particular of petroleum oils, are commonly expressed in terms of degrees on the Baumé scale. We have also to remember that density will vary with temperature and hence, if the assumed working temperature is different from that used for the determination of the Baumé density, a suitable correction must be made.

To estimate the density of a petroleum oil at any assumed working temperature we have then as follows:

$$\sigma_1 = \frac{8736}{130 + B} \quad (5)$$

Where  $\sigma_1$  = density in pounds per cubic foot for oil at 60° F.

$B$  = gravity on Baumé scale assumed to have been taken at 60° F.

$$\sigma = \sigma_1 - \left( \frac{121.2 - \sigma_1}{2713} \right) (t - 60) \quad (6)$$

Where  $\sigma$  = density in pounds per cubic foot for oil at working temperature of  $t^\circ$  F.

$t$  = working temperature assumed.

Equation (6) is simply an empirical relation between density and temperature which is found to be approximately correct for California oils.

(4) Viscosity  $\mu$  is to be expressed in absolute English units; foot, poundal and second. In common practice, however, viscosity is more usually expressed in terms of  $t$ , a time of flow, on an arbitrary or comparative scale, and varying according to the particular instrument employed. The three types of instrument most commonly met with are the Saybolt, Engler and Redwood.

The following equations may be used to convert the time  $t$ , representing the reading on these instruments, into values of  $\mu$  in the units desired.

$$\text{Saybolt} \quad \frac{\mu}{\sigma} = .00000237t - \frac{.00194}{t} \quad (7)$$

$$\text{Engler} \quad \frac{\mu}{\sigma} = .00000158t - \frac{.00403}{t} \quad (8)$$

$$\text{Redwood} \quad \frac{\mu}{\sigma} = .00000280t - \frac{.00185}{t} \quad (9)$$

Where  $\mu$  = viscosity in absolute English units (foot, poundal, second).

$\sigma$  = density in pounds per cubic foot.

$t$  = time on instrument (Saybolt, Engler or Redwood) (seconds).

If then the viscosity under the assumed working temperatures is known or assumed, in terms of Saybolt, Engler or Redwood units, we have only to substitute the value  $t$  in the suitable formula, and find the value of  $\mu/\sigma$  and hence of its reciprocal  $\sigma/\mu$ . The

latter may then be directly used in finding the value of the argument  $Dv\sigma/\mu$  or otherwise the values of  $\mu$  and  $\sigma$  may be individually employed if desired.

It often happens, however, that values of the viscosity may be known for certain standard or reference temperatures, but not for the temperatures assumed as representing the conditions of operation. To meet this situation there is needed some relation between viscosity and temperature. Such relation, however, is apparently exceedingly complex and does not admit of simple algebraic expression.

Broadly, viscosity varies in inverse direction with the temperature. Thus starting with a high temperature and assuming a gradual cooling it is found that the increase in viscosity is at first slow, the rate of increase rising rapidly as the temperature drops.

Professor W. R. Eckart of Stanford University has pointed out that the relation between viscosity  $\mu$  and temperature  $t$  when plotted on double logarithmic scales shows a close approximation to a straight line, at least over the working range of temperatures for which the liquid may be said to retain its identity. At high temperatures, the more volatile constituents will begin to vaporize and at very low temperatures certain constituents may begin to solidify and separate out, thus in either case changing the character of the liquid itself. Between these limits of temperatures, however, Prof. Eckart has shown by a large number of cases that within the limits of observational error the straight line relation may, for all practical purposes, be assumed to hold.

It thus results that if the value of  $\mu$  for a given oil is known for two temperatures, the logarithmic plot may be drawn as a straight line between these points and extended over the working range of temperatures, thus giving a direct and practical form of relation between viscosity and temperature and specifically, the value of  $\mu$  for any specified temperature within the working range.

Among various numerical data regarding viscosity the following may be cited:

A. C. McLaughlin<sup>1</sup> gives diagrams showing the relation between temperature  $F$  and absolute viscosity for a series of American oils from which the following may be drawn:

TABLE 2

Temperatures Fah.	Viscosity <sup>2</sup>
60°	.060 to .300
80°	.040 to .250
100°	.020 to .160
120°	.016 to .080
140°	.013 to .045

The densities of the oils to which these values refer range from 56.8 to 60.0. (Gravity Baumé 24 to 18 app.)

From tests made by Cooper on 60 samples of California petroleum, R. P. McLaughlin<sup>3</sup> gives values for the relation between viscosity and gravity from which the following tabular values are derived.

The very rapid increase of viscosity with density will be noted for 60° beginning about density 57 and for 185° beginning about density 60.

<sup>1</sup>Journal, Am. Soc. Mech. Engrs., 1915, p. 263.

<sup>2</sup>The units involved in these values are the foot, poundal, second.

<sup>3</sup>Journal, Am. Soc. Mech. Engrs., 1915, p. 264.



TABLE 3

Gravity Baume	Density at 60° F. Lbs. per cu. ft.	Viscosity <sup>1</sup> at 60° F.	Viscosity <sup>1</sup> at 185° F.
36	52.6	.0040	.00076
34	53.3	.0050	.00090
32	53.9	.0070	.00120
30	54.6	.0103	.00160
28	55.3	.0145	.00206
26	56.0	.0206	.00260
24	56.7	.0280	.00320
22	57.5	.0370	.00380
20	58.2	.0760	.00440
18	59.0	.2640	.00650
16	59.8		.01120
14	60.7		.02450
12	61.5		.14800

From a number of tests made on California oils Dyer<sup>2</sup> gives for oils of four different gravities values of the viscosity for varying temperatures from which the following tabular values are derived.

TABLE 4

Gravity, Baume <sup>1</sup>	18.2	16.6	15	12.1
Density, lbs. per cu. ft.	58.95	59.59	60.26	61.48
Temp. F.	Viscosity <sup>1</sup>			
50°	.7360			
60°		1.0530		
75°	.2450	.4970	1.5670	
100°	.1220	.2230	.3440	
110°				1.6610
125°	.0670	.0990	.1500	.6140
150°	.0365	.0490	.0750	.2110
175°	.0242	.0245	.0310	.1020
200°	.0216	.0220	.0220	.0510

The above oils are noted to have contained about 2% of water.

<sup>1</sup>The units involved in these values are the foot, poundal, second.

Again viscosity is frequently met with expressed in terms of metric units. Here again two units may be encountered—the absolute unit based on the centimeter dyne, second, or the centipoise which is .01 absolute unit.

To convert these various measures into one another we have the following:

Viscosity (foot, poundal, second) = viscosity (centimeter, dyne, second) ÷ 14.88.

Viscosity (foot, poundal, second) = viscosity (centipoise) ÷ 1488.

Instead of equation (2) giving in feet the head used up in friction, it is commonly more convenient for practical use to transform the equation in such manner as to give the pressure gradient per mile or otherwise the pressure head used up in friction expressed in pounds per square inch per mile of pipe. To this end we multiply equation (2) by  $\sigma$  and put  $L = 5280$  giving pounds per square foot per mile of line and then divide by 144 reducing it to pounds per square inch per mile of line. This gives

$$G_m = \frac{36.67 f \sigma v^2}{D \quad 2g} \quad (10)$$

### Illustrative Examples

We may illustrate briefly the operative steps in the use of the preceding formulæ by the following numerical examples:

Given:

Quantity of oil per day.....24000 bbl.  
Diam. of line.....8 inches  
Working temperature assumed at .....100° F.  
Gravity of oil at 60° F.....18 Baumé  
Viscosity at working temperature taken at .12.

We find first  $v = 4.47$  (fs)

Then: from (5) density at 60° = 59.02

and from (6) density at 100° = 58.10

We then find the value of  $Dv\sigma/\mu = 1443$

This implies stream line motion and (4) gives a value of  $f$  about .0444.

Substituting this in (10) we find the pressure gradient 44.1 pounds per square inch per mile of length.

Again if we should take the oil of gravity 16 B. at 60° F. with a working temperature of about 110° F. and a value of  $\mu = .15$  we should find similarly a value of  $Dv\sigma/\mu = 1166$ , a value of  $f$  about .055 and a pressure gradient  $G_m = 55.2$  pounds per square inch per mile of length.

Again, suppose a 10-inch line with oil gravity 20 B. at 60° F. and at an average working temperature of 110° F. and with a velocity of 5 feet per second. We may then take  $\mu$  about .06. We then find as above for the density at 110°  $\sigma = 57.08$ .

This gives a value of  $Dv\sigma/\mu = 3964$  implying turbulent flow and for commercially smooth pipe a value of  $f$  about .04. If 10% is added for a slightly roughened surface we have  $f = .044$  and substitution in (10) gives a pressure gradient 55.2 pounds per square inch per mile of length.

Suppose again that we have a record of  $t = 1000$  for the Saybolt viscosity of a given oil at 100° F. Then for the value of  $\mu/\sigma$  in absolute units we have from (7)  $\mu/\sigma = .002368$  and  $\sigma/\mu = 422.3$ . Again if  $t = 4000$  we shall have  $\mu/\sigma = .00948$  and  $\sigma/\mu = 105.5$ . If in the first case the oil is one showing a Baumé gravity at 60° of 17.5 we shall have from (5)  $\sigma_1$  at 60° = 59.22 and from (6)  $\sigma$  at 100° = 58.31 and hence  $\mu$  at 100° =  $58.31 \times .002368 = .1381$ .

It is, of course, always desirable to have values of  $\mu$  and  $\sigma$  derived directly by test from the oil in question and at the working temperatures assumed. In default of this precise information, the best practicable approach must be made by a comparison with known data as in tables 1, 2, 3, and through formulæ and relations such as those indicated in the latter part of the present paper.

With reasonably accurate values of  $\mu$  and  $\sigma$  in any given case and a quality of pipe surface not too far removed from what has been termed commercially smooth, the procedure herein indicated may be followed with confidence regarding the resulting values of  $f$  and  $h$  or  $G_m$ . With old and roughened pipe surface, due allowance must be made by judgment and in the light of such information as may be available regarding the values of  $f$  applicable in such cases.

In any case the procedure herein indicated may be urged as undoubtedly more reliable and more widely applicable than any empirical combination of density or viscosity or both in a d'Arcy or other hydraulic formula, but not resting on the basic principles of rational mechanics, as does the method presented herewith.

Article number eleven of the New Physics series by Dr. A. C. Crehore has been held over until the issue of May 15th in order to make room for the special article by the same author which appears on another page of this issue.

<sup>1</sup>The units involved in these values are the foot, poundal, second.

<sup>2</sup>Journal, Am. Soc. Mech. Engrs., 1915, p. 259.



# Choice of Electrical Equipment for Gold and Silver Mining

BY B. B. BECKETT

(The following detailed analysis of the troubles and cures of electrical mine equipment by B. B. Beckett, mining electrical engineer, have application to other motor applications such as cement works and foundries where severe operating conditions are met. Much of the author's discussion is based upon his extensive practical experience in the mines of Goldfield, Nevada.—The Editor.)

The three-phase system is exclusively used in this industry, except for railways and such special purposes as electrolytic precipitation. This discussion may therefore be confined to three-phase motors and devices. The generating plant will not be included, as that is a subject in itself, although very large and complete generating plants are sometimes operated as part of a mining enterprise.

The choice between synchronous motors and induction motors is an economic problem which must be solved for any particular case and depends upon the value of high power-factor versus simplicity; but, in general, synchronous motors should be used only for large air compressors, motor-generators, centrifugal pumps, and perhaps tube mill drive, although the last item will then require friction clutches for starting.

The choice between squirrel cage motors and slip ring motors is also an economic one to be solved in any particular case wherever the starting requirement is severe. In general, a slip ring motor is preferable to a combination of squirrel cage motor and friction clutch, as friction clutches so used give a great deal more trouble.

Standard stock motors should be used for all ordinary operations both underground and on the surface, except that the more flimsy designs should be avoided. The service is rough as compared with that in some other industries, but the difference is not so great as to justify special design, with attendant difficulty in obtaining replacements and repair parts. For the same reason, all non-standard features should be avoided such as special speeds, special shaft extensions and special brackets on frames, unless these are clearly justified by other considerations. It is also desirable that as many motors be exactly alike as is consistent with good efficiency. It is not so important that they be of the same make as that they be of the same speed and have the same size of shaft extension, so that replacements and exchanges may be made quickly with a minimum number of repair parts on hand.

In regard to speed, it should be noted that high speed motors are not only cheaper but usually also more efficient. They have the additional advantage of being lighter and easier to handle. No objection can be made against the high speed, mechanical or electrical, so far as the motor itself is concerned, but considerations of drive fix certain limits, as given in the table below. This table is based upon the writer's experience, taking into consideration the quality of construction and the kind of operators usually found in mining camps. The recommended speed for gearing is much lower than for belting. This refers to plain spur gearing. If herring-bone gearing is used, or if a flexible coupling is interposed between

motor and first pinion, the speed recommended for belting may be used, and the same is true for silent chain. In general, plain spur gearing should be avoided except where the service is light or infrequent.

Direct connection is, of course, the ideal drive and should be used in all cases where the speed of the driven machine is suitable, except where it may be desired to change the speed readily. Even where the desired speed is so low as to call for special motors, this is frequently justified by the advantage of direct drive, but each particular case of this sort must be figured out for itself. It should be noted here that direct connection does not mean merely coupling a motor direct to drive shaft that is itself geared to the machine proper, as in a triplex pump. This would be a gear drive and only low speed motors should be used for this purpose; but such an arrangement is decidedly preferable to a high speed motor with double reduction gearing. For true direct drive, like that of a centrifugal pump, the higher the speed the better, up to 1800 rev. per min., and even 3600 is satisfactory for small sizes, so far as the motor is concerned.

**MOTOR SPEEDS RECOMMENDED**  
60-Cycle Motors

Motor rating, hp.	REV. PER MINUTE		REV. PER MINUTE	
	For Belting	For Gearing	For Belting	For Gearing
	Highest allowable	Most desirable	Highest allowable	Most desirable
1	1800	1800	1200	900
2	1800	1800	1200	900
5	1800	1200	900	900
7½	1800	1200	900	720
10	1800	1200	900	720
15	1200	1200	720	600
20	1200	900	720	600
30	1200	900	720	600
50	900	900	600	600
75	900	720	600	514
100	900	720	600	514
150	720	600	514	450
200	720	600	450	400

In modern starters a number of special features have been incorporated. A low-voltage release and overload relays should always be provided and should be inside the starter case or integral with it so that the wiring is enclosed and the mechanism entirely dust proof. The mechanism should not be readily accessible, else it is liable to be blocked or the setting to be changed. The starter case should be arranged for conduit wiring. The push-and-pull type of handle is usually preferred by operators, that is, the handle at the side of the case instead of in front. Quick-make and quick-break movement is greatly to be desired, but is not yet available except in electrically operated starters. The ammeter as a starter feature is also to be recommended in most cases for large sizes, say 50 hp. and over. It should be connected in circuit in starting as well as in running, for its chief use is in starting to determine when the motor has come up to speed ready for the throw-over. It



should, of course, have a scale reading high enough for the starting current, about four times normal full load current. This will make the running current rather low on the scale, but this is desirable too in most cases, else the continual swinging of the needle under load fluctuations will make accurate readings impossible and also wear out the meter. It is not necessary to read accurately. The operator will soon learn about where the needle normally stands, and will note an unusual position, indicating trouble somewhere.

#### Electrical Equipment of the Mill

Starters are not usually provided with motors of 5 hp. and under, but they may be desirable down to 2 or even 1 hp. in order to reduce the jerk that accompanies starting direct on the line; and they may be omitted with much larger sizes, 20 or even 30 hp. if the starting jerk is permissible and if the line will stand the current rush without too much voltage disturbance to other motors. However, there is not much saving in omitting starters with large motors, since an oil switch must be provided instead large enough to handle the heavy current.

When no starter is used, the switch that takes its place should be of one of the modern "safety first" designs. It should be enclosed to prevent accidental contact, should be either an oil switch or else provided with barriers to prevent flash-over, and should be of quick-make and quick-break design. It should be equipped with low-voltage release unless the conditions are clearly such that no danger can result from unexpected starting after an interruption of power supply. For overload protection, simple fuses are about as good as anything else; but if low-voltage release is used, then it is well to use overload relays also, since these can be added at little expense. If relays are used, these should be in circuit both in starting and running and no fuses should be used at all unless the service line is long enough to require fuses at the branch point.

The matter of overload protection is in flux. There is no device on the market that will protect a motor against overload under all conditions, and the main reliance must still be put in the watchfulness of the operator and the fact that the motor has been made large enough to carry any load likely to come upon it. Simple fuses, if used, must be 50% to 100% larger than the size corresponding to the normal current, in order to avoid the nuisance of unnecessary shut-downs. Instantaneous circuit breakers must be set about 200% over normal load, and inverse time relays at least 50%. At first thought, it may seem that the inverse time relay could be designed with a sufficiently long time element to correspond with the rate of the heating of the motor, so that it will not trip until the motor is really in danger, and still have a continuous current rating that is safe for the motor. The reason this cannot be done is that this device is lacking in two particular principles. It takes no account of atmospheric temperature nor of the preceding load. In other words, the motor may be very hot when the overload begins and therefore the time element of the relay must be short or the motor will be damaged, but this same time element

at another time, the motor being cool, will result in unnecessary shut-down. What is really needed is some form of heat storage or "thermo-relay." The fusible link and heating element type of plug fuse now on the market is a step in this direction.

With the starters now on the market, the relays are in circuit only in running, being too quick acting to take the starting current of large motors, and it is therefore necessary to provide additional protection against short circuit in starting. Simple fuses are sufficient for this and these may be the fuses at the branch point, which are required anyway, unless the service line is very short.

For variable speed motors in hoisting or similar service, the simple drum controller is satisfactory up to about 50 hp. Above this, if the service is frequent contactors should be used in the primary circuit, and above 100 hp. full contactor with automatic notching up should be used. The liquid rheostat, because of maintenance difficulty, is not to be recommended except for large hoist motors. The tendency is toward contactor control for all sizes. Regarding regulation of load fluctuations, by fly-wheel or other device, the tendency is toward omission of all such complications unless the characteristics of the power supply system make regulation imperative. This depends primarily upon the size of the system, particularly upon the aggregate fly-wheel effect of rotating apparatus connected to the system in the immediate district. As a rough rule, hoist motors may be used without regulation up to a rated capacity for any one motor equal to 10% of the average steady load on the same substation or generating station, as the case may be. This limit may be considerably exceeded without serious trouble, but the service will not be good.

Regarding protective devices for variable speed motors, these are of little importance in any case where the motor runs only when an operator has his hand on the controller. Low-voltage release is of no benefit and overload protection should be looked upon as short-circuit protection merely. Any overload device must be set at least double the normal load.

In underground service, standard motors and control devices are satisfactory. The standard insulation will not last as long as above ground, but special insulations, so far as the writer has tried them, are very little better. In precious metal mines, inflammable gases are not to be feared and it is usually practicable to protect the motor from dripping water and acid. All electrical equipment underground will fare better if always kept warm, either by load or special means. In Goldfield, the life of windings underground was only one to three years, but this short life was due in part to the fact that these motors were usually geared and therefore subjected to vibration and were oil soaked.

The best method of wiring, above ground, is in rigid iron conduit, if properly done, but open wiring is better than conduit wiring improperly done. In general, services and small branches should be in conduit; but for mains, where they can be run overhead in the clear, the advantage is too small to jus-



tify the expense. Metal service boxes should be provided to house the branch switch and cutout and the wiring from this on to the motor should be entirely in conduit. When the installation is large, requiring heavy copper mains, these should be broken up into several circuits and should be grouped by circuits and not by phases, in order to avoid excessive inductive reactance. For instance, at the Consolidated mill in Goldfield, the reactive drop was actually about 12 times the ohmic drop in the 440-volt mains.

Wiring underground should never be in iron conduit, as it is liable to be eaten through by acid

water and will then be worse than nothing. In shafts and main tunnels, lead-covered cable should be used. Elsewhere, up to 600 volts, open rubber-covered wire is satisfactory if guarded against accidental contact. Most underground construction in precious metal mines, except in main shafts and tunnels, is temporary, but is frequently in service much longer than expected and the tendency to flimsy construction should be combated. Switch boxes, telephone cases, and other boxes housing electric equipment should be kept warm by means of an incandescent lamp constantly burning inside in order to prevent deterioration of insulation and the leakage of current across slate and porcelain surfaces.

## The Velocity of Propagation of Gravitation

BY A. C. CREHORE, Ph.D.

(Whether the force of gravity, or the force acting between two bodies in space is instantaneous or necessary time must elapse before this force becomes effective, has ever been a subject that has perplexed scientists the world over. If such a time must elapse the time interval must necessarily be very short. Here is an interesting discussion on this important point by Dr. A. C. Crehore who has for some months past been contributing a notable series of articles on the new physics to the columns of the Journal of Electricity.—The Editor.)

The following remarks have been prompted by a sentence in the short paper by A. H. Halloran in the Journal of Electricity for March 15, 1920, in which reference is made to my theory of gravitation. The sentence has particular reference to the old question of the velocity of transmission of the gravitational force, and reads: "Newton's law of **instantaneous** gravitational action, however, is upset by Einstein's deduction that no action can exceed the velocity of light."

No statement as to the velocity of transmission of the gravitational action is to be found in Newton's original statement of the law of gravitation. And, moreover, it was not Einstein who first introduced the conception that all effects propagated through the ether of space take place with the velocity of light. This is the fundamental basis underlying the current form of electromagnetic theory as exemplified by the Lorentz form of this theory.

### Gravitation an Electromagnetic Phenomenon

As soon as we abandon the idea that the gravitational force is an effect peculiar to itself, and not at all connected with electromagnetic phenomena, and adopt instead the form of the gravitational equation which I have deduced by means of a modified Lorentz theory, modified to make the dimensions of the equation agree with the dimensions of a mechanical force, we have then included gravitation in the realm of electromagnetic phenomena.

This automatically means that none of the effects comprehended within my theory are propagated with a speed exceeding the velocity of light.

It was probably Laplace's celebrated treatment of the motion of a comet under the influence of the sun's attraction that focused the attention of the world on the subject of the velocity of transmission of a gravitational influence, no mention of which is contained in Newton's original statement. So that it now seems advisable to look at the question afresh,

that is to say from the standpoint of the author's theory of gravitation.

### The Hypothesis of Laplace

Laplace made the hypothesis that the gravitational force was due to some unknown influence emanating out in straight lines from the sun, and meeting the comet at each point of its path as it described a hyperbolic orbit around the sun. On this hypothesis he reached the entirely legitimate conclusion that the comet must deviate by an easily observable amount from a true hyperbolic path, if the supposed unknown influence constituting the gravitational force were propagated with a velocity equal to that of light. He showed that the path would deviate less and less as its velocity is increased more and more, but at the same time that the deviation from the hyperbolic orbit would still remain within observable limits even if the velocity of his supposed gravitational influence exceeded the velocity of light many times.

This gave rise to the notion that this gravitational influence, whatever it was, must travel at a very excessively great speed, say an infinite speed, if we please; for this would really be required to prevent the orbit from deviating theoretically at all from the exact hyperbola.

### Physical Phenomena Which Make Up Electromagnetic Theory

Let us, therefore, examine more attentively the physical phenomena which form the foundation in electromagnetic theory of the present view of gravitation. An infinite velocity really implies that the effect has already traversed the distance, say from the sun to the comet, and is already there, so to speak, at the point of the orbit in question even before the comet has reached this point of its future path. This is shown to be exactly the state of things when the theory of gravitation described in "The New Physics" is examined in detail.



To fix the ideas, consider the effect of a single electron in space revolving at a uniform rate in a circular orbit, this electron being, so far as we are now concerned, the only one in existence. Let the circle of its orbit be represented by the small circle,  $e_2$ , at the right of Fig. 1, in the plane of the paper.

### Lorentz' Theory

According to the Lorentz electromagnetic theory this revolving electron radiates out its influence in all directions in space, and, assuming now that this electron has been so revolving for an exceedingly long time, its influence has had sufficient time to travel to the uttermost limits of space, as far as the imagination can travel.

The general form of the mechanical force equation, due to Larmor and Lorentz, which a charge  $e_2$  exerts upon a charge  $e_1$ , is

$$\mathbf{F} = e_1 \left( \mathbf{E} + \frac{1}{c} \mathbf{q}_1 \times \mathbf{H} \right),$$

where  $e_1$  represents the electrical charge upon which the force is exerted, and  $\mathbf{q}_1$  is the vector velocity of this charge. If there is no second charge,  $e_1$ , there is no mechanical force  $\mathbf{F}$ , the expression reducing to

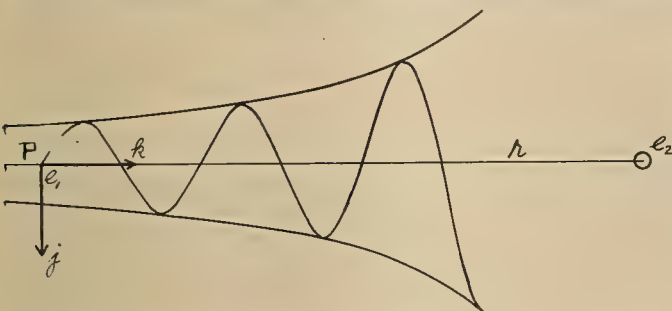


Fig. 1—Diagram to show the effect of a single electron in space revolving at a uniform rate in a circular orbit. The circle of its orbit is represented by the circle  $e_2$  at the right of the figure.

zero. And, again, if there exists a charge,  $e_1$ , and its velocity,  $\mathbf{q}_1$ , is zero, meaning that it is at rest, the second term of the expression vanishes, leaving

$$\mathbf{F} = e_1 \mathbf{E}$$

$\mathbf{E}$  and  $\mathbf{H}$  are vector expressions sometimes called the electric and magnetic components of the electromagnetic force, but they only become forces when multiplied by an electrical charge.

Suppose now that a stationary charge,  $e_1$ , suddenly appears at some point of space, P, being created if necessary to aid in the mental picture, it will at once and **immediately** experience the force  $e_1 \mathbf{E}$  corresponding to its location with respect to the revolving electron,  $e_2$ , without any delay whatever, for the field  $\mathbf{E}$  is already there, so to speak. This would be true wherever one placed the charge,  $e_1$ , for the field of  $e_2$  has already traversed all space, which may be considered to be filled with standing electromagnetic waves.

### The Question of Distances Between Charged Bodies—

When the distance is great between  $e_1$  and  $e_2$  it may be shown that the force  $e_1 \mathbf{E}$  according to the Lorentz theory, assuming the conditions to be as represented in Fig. 1, may be very approximately represented by the equation

$$e_1 \mathbf{E} = - \frac{e_1 e_2}{r} \frac{\beta_2^2}{a_2} \cos \left[ w_2 \left( t - \frac{R}{c} \right) + \theta_2 \right] \mathbf{j}.$$

The axes of the reference here,  $i$ ,  $j$ , and  $k$ , are centered at the point P, the  $k$ -axis coinciding with the line joining centers in the plane of the paper, the  $j$ -axis being directed downward in the figure, and the  $i$ -axis being upward perpendicular to the paper. The distance from  $e_2$  to  $e_1$  is denoted by  $R$ , and this at great distances is not sensibly different from the distance from the center of the orbit of  $e_2$  to the fixed  $e_1$ , denoted by  $r$ .  $w_2$  is the angular velocity of the electron,  $e_2$ , in its orbit,  $c$  the velocity of light,  $a_2$  the radius of the orbit of  $e_2$  and  $\beta_2$  its speed in terms of the velocity of light as unity.

The whole force is evidently a simple harmonic force along the  $j$ -axis coinciding in frequency with the revolution of the electron,  $e_2$ . At some time in its cycle of variation this force is evidently zero at the point P; but it is not then zero at other points along the line joining centers. When the force is zero the cosine must be zero, and we have

$$w_2 \left( t - \frac{r_1}{c} \right) + \theta_2 = \frac{\pi}{2},$$

where  $r_1$  now represents the distance to P. As the point P moves towards  $e_2$  we eventually arrive at a new position,  $r_2$ , where the force is zero at the same time, and

$$w_2 \left( t - \frac{r_2}{c} \right) + \theta_2 = \frac{\pi}{2} + 2\pi$$

By subtraction

$$\frac{w_2}{c} (r_1 - r_2) = 2\pi$$

$$\text{or } r_1 - r_2 = \frac{2\pi c}{w_2} = \frac{2\pi c}{2\pi n} = \frac{c}{n},$$

where  $n$  is the frequency of the vibration. This change in the distance is merely the wavelength,  $\lambda$ , since

$$\lambda = \frac{c}{n} = r_1 - r_2.$$

### The Mapping of the Field of Force

The whole field of force may then be mapped out along the radius  $r$  by laying off equal intervals,  $\lambda$ , and by representing the force at intermediate points by a harmonic curve, as in the figure. The amplitude of the harmonic curve, however, must increase as  $e_2$  is approached because of the factor,  $\frac{1}{r}$ , in the coefficient of the equation. At half the distance the force is doubled, and so on. This curve represents the force at each point at the same instant of time. As time passes, this field would present the appearance of waves traveling outward from  $e_2$  with the velocity of light, although the harmonic force at each point remains fixed and stationary. The case is very analogous to one of the electric advertising signs in which an effect is made to appear to be propagated with considerable velocity, merely by giving a harmonic variation to the light intensity of each fixed lamp.



Similarly, along every radius emanating from the center of the orbit of  $e_2$  there is formed a like picture, and, were these waves visible, they would appear to be streaming out from this center with the velocity of light. But, the velocity with which these waves travel has nothing to do with the so-called velocity of propagation of the gravitational effect. The field is already there, and is definite and fixed at every point of space surrounding  $e_2$  long before the electron  $e_1$  entered the region.

When the second charge,  $e_1$ , enters this field, or rather moves about in it, for it could hardly escape always being in some point of the field, the effect that it experiences is due to the existing field already at the point in question, an effect already present, and requiring no time for its transmission from some distant place.

The very fact that the difficulty of Laplace, really injected into the subject because of his concept of the cause of the gravitational effect, has vanished into nothingness by considering the definite physical concepts of the author's theory of gravitation as dependent upon an electromagnetic basis,—this in itself furnishes strong reasons in support of the new theory.

In conclusion, it ought to be pointed out that the forces which have been used above, both in the equation and its graphical representation in Fig. 1, are but one component part of the total force, namely, that part which varies inversely as the distance. There is no component of this inverse distance force that acts along the line of centers,  $r$ , so that the author's gravitational force is not represented in this diagram at all.

#### **The Magnitude of That Part of the Force Varying as the Inverse Square**

The magnitude of that part of the force varying as the inverse distance may, however, be made far greater than any component varying as the inverse square or higher powers merely by taking the distance,  $r$ , large enough. Assuming that the figure represents large distances only, the force there represented would not be changed in sufficient degree to be perceptible to the eye by the addition of all other components. This inverse distance component of the force, however, illustrates the matter of the standing waves, that is, waves which do not change their magnitude with time at a given point in space, and takes care of the matter of the velocity of propagation of gravitation with which we are immediately concerned, just as well as if the inverse square component were used alone in the diagram. The reason for illustrating by means of the former instead of the latter, or the real force in question, is because the inverse distance component is capable of simpler mathematical expression, and is adapted to be illustrated by a diagram.

This inverse distance component is by far the greater force, and, while it contributes nothing to the gravitational effect, yet in the author's theory of the atom this is the force that is concerned with the radiation of energy.

### **THE FOREIGN TRADE CONVENTION**

Probably the greatest international conference of business men ever held is to take place in San Francisco, from the 12th to the 15th of May. This is the Seventh National Foreign Trade Convention, and while it is termed "national" and is truly such in that its prime aim is the promotion of American commerce, yet this year it takes on an international character because of the great number of delegates coming from all parts of the world. These delegates are already arriving, and when gathered together they will represent every country bordering on the Pacific, besides the nations of Europe and those on the eastern coast of South America. The total attendance will in all likelihood exceed 2500.

The convention will be presided over by James A. Farrell, of the United States Steel Corporation, chairman of the National Foreign Trade Council, under whose auspices the convention is called. O. K. Davis is secretary of the Council and has directed the preparations for the conference, assisted by C. P. Converse, Pacific Coast secretary. The program will consist of general sessions, in which the broad questions of American commercial policy will be discussed, and also of group sessions, for the consideration of specialized trade topics. Virtually every phase of world commerce will come before the assembled delegates.

"Problems of the Pacific" will be the main consideration, and it is truly indicative of the importance attached to this great trade field by all American merchants that a Pacific Coast port should be selected as the scene for the greatest of all trade meetings. San Francisco may rightfully claim to be a world port. The growth of all the Pacific Coast ports has been phenomenal, their total exports and imports having risen from \$238,000,000 in 1912 to \$1,114,000 in 1919.

To men of the electrical industry the convention holds much of interest, and they will be well represented, despite the attractions of the other great Pacific Coast gatherings. The exports of electrical machinery and apparatus this fiscal year will probably exceed \$80,000,000 in value, the principal items being motors, dynamos and generators, insulated wire and cables, and batteries. It is interesting to note, however, that exports of electrical heating and cooking apparatus have doubled within the year. Much needs to be done in the development of this export trade to the Orient and Latin America, and unquestionably the convention will aid in its promotion.

Among the delegates already enrolled for the convention are:

D. A. Merriman, American Steel & Wire Co., Chicago, Ill.; F. V. Burton, Bryant Electric Co., Bridgeport, Conn.; Fred B. Whitney, Deselektro Co., Evans Bldg., Washington, D. C.; Alex. S. Tilley, Foundation Co. of New York, 58 Sutter Street, San Francisco; M. A. Oudin, New York City, Chas. M. Muchnic, Schenectady, and G. I. Kinney, San Francisco, all of the International General Electric Co.; R. C. Lanphier, Sangamo Electric Co., Springfield, Ill.; R. E. Martinez, West-house Electric & Manufacturing Co.



## SPARKS—Current Facts, Figures and Fancy

(The radio duck, power plants on the Panama Canal, the electric auto heater, new electric cast-steel cables—facts of import and facts of fancy alike find space in the following columns. The latest uses of electricity in the world of the movie man, the farmer and the housewife, are also recorded along with a brief summary of reconstruction progress across the Atlantic. —The Editor.)

Aluminum is being considered by the Japanese hydroelectric plants to replace copper in their heavy transmission cables. Copper has been used exclusively for this purpose heretofore, but even with a 25 per cent duty, aluminum can compete successfully on the basis of price.

\* \* \*

Great honor is due any factor which makes "four blades grow where three grew before." And this very honor is rightfully due electricity, since the announcement that certain Western green-house men have "forced" lettuce by regulating the growth by an elaborate electric lighting system. Four crops of lettuce are thus matured in the same period ordinarily required for three.

\* \* \*

When the movie photographer finds difficulty in taking the day-time street scene because of necessary traffic interruption, the powerful searchlight comes to the rescue and allows him to do the work at midnight when the streets are clear. Searchlights shine upon the scene from every side so that the work can be carried on the same as though the sun itself were shining.

\* \* \*

During the month of January the total gross output of both plants on the Panama Canal was 5,894,400 kw-hr., the total power distributed to consumers being 5,006,940 kw-hr. The total loss of power plant auxiliaries, transmission, transformation and operation of steam plant generation for standby service was 887,560 kw-hr., or 15.06 per cent of the gross output.

\* \* \*

The use of electric stoves and heaters is ardently encouraged in view of the fact that sixty million tons of fuel must be saved annually in this country to insure an adequate supply for the winter months. It is estimated that a saving of from three to four tons of coal a year is made where the average family uses electricity exclusively for cooking purposes. The extensive use of electric stoves and heaters is evident from the fact that sixty-three various styles of stoves and heaters have been placed on the market by one manufacturer.

\* \* \*

As in the old war days, we are always ready to greet reports of progress "over there." It is encouraging to know that 6,000 miles of the 50,000 miles of barbed wire laid in northern France during the war have been rolled up. Figures on the reconstruction of homes in France show that 60,000 of the

550,000 houses wrecked by shell fire have been made habitable, mostly with temporary repairs. Of the 1,160 industrial plants destroyed, 588 have been repaired. The government has repaired 2,016 kilometres of the 3,246 kilometres of railways that were torn up and 700 of the 1,675 kilometres of canals rendered useless are again in commission.

\* \* \*

With the greatly increased output of ships in America, a noticeable shortage of chain cables and wrought iron suitable for their manufacture has arisen. An American company has developed the manufacture of electric cast-steel cables, and has submitted samples of four different sizes to very severe tensile and shock tests, the results showing the tensile strength to be from 73 to 93 per cent over that required by the statutory tests for iron cables, and the resistance to shock being still greater than these proportions. Since the results were so satisfactory, the surveyors have recommended that sanction should be given for the use of such cables.

\* \* \*

The latest wireless instrument seems to be none other than our old friend the duck. An ingenious youth, formerly a wireless operator, has discovered that he can communicate with a friend living about 200 yards away by means of a certain duck which has an unusually loud and penetrating voice. When the duck is taken up in the operator's arms, it rapidly responds with a long-drawn "qua-a-ack" if it is gently pulled by the tail and held for a second or so. On the other hand, the duck shoots out a short, sharp quack when his tail is pulled and let go instantly. The young man now sends his messages by Morse code to his friend, who is looking for an equally intelligent duck with a voice of 200 yards' range with which to reply.

\* \* \*

Where the winters are very cold there is real danger in leaving the auto unprotected on the street, and so the electric street heating station has been developed. The station is so effective and practical that the day may not be far distant when such stations will be erected on poles throughout the city so that no motorist need leave his machine unprotected from the harmful consequences of severe cold. The station already established has two outlets. Cars which use it are equipped with ordinary household heating appliances, which may be placed beside the motor to keep the water-cooling system from freezing up and to insure easy starting, and which may as easily be installed in the body of the car to maintain a pleasant atmosphere for passengers.



## PERSONALS

Lafayette Hanchett has been elected president of the Utah Power & Light Company at a recent meeting of the board of directors. Mr. Hanchett succeeds D. C. Jackling, who resigned from the position a short time ago. Mr. Hanchett is a prominent mining engineer and has long been active in a great number of industrial and commercial activities. He is president of the Intermountain Electric Company of Salt Lake City, and also of the Dixie Company which operates in southern Utah. Mr. Hanchett is a director in the National



Copper Bank and Trust Company of Salt Lake City, and is identified with several other large enterprises. Mr. Hanchett acted as assistant to Mr. Jackling, former president of the company, in managing the government powder plant at Nitro, West Virginia, during the war.

G. H. Jamison and H. S. Peck, formerly connected with the Milwaukee electrification, are now connected with A. H. Cox & Company, engineers and contractors, 307 First avenue South, Seattle.

W. A. Patton, construction manager of the Stone & Webster division of construction and engineering, Boston office, was in Seattle early in April. He returned to Boston by way of California and Texas.

James D. Howe, general counsel, W. H. Somers, freight traffic manager, and E. O. Barnes, manager, Seattle division, Puget Sound Power & Light Company, visited the Boston office recently. Messrs. Barnes and Somers have returned to Seattle. Mr. Howe has not yet returned. The trip was made in connection with business of the district.

C. C. Turlay, for ten years in charge of the Vancouver plant of the Portland Railway, Light & Power Company, but who for the last three years has been in other places, has now returned to the company in that city. He will act as commercial engineer and the present personnel of the office will not be changed. Forest Gay has charge of the office and business.

Fred D. Weber, electrical engineer and vice-president of the State Board of Engineering Examiners, state of Oregon, has gone to Chicago to attend the National Convention of the National Fire Protection Association, May 3, 4, 5 and 6, 1920. On the 7th of May he will attend a meeting of the Electrical Council of the Underwriters' Laboratories, Inc., of which he is a member. He will return about May 12th to Portland.

M. T. Crawford, superintendent of distribution of the Puget Sound Power & Light Company, Seattle, has returned from an extensive trip through the East during which he studied underground d.c. and a.c. installations so as to apply the information that he gained to such extensions as the Company may be called upon to make. He visited Schenectady, Pittsburgh and other large cities of the East and returned home by way of Omaha, Denver and Los Angeles.

John C. Jones, manager of the Westinghouse Electric & Manufacturing Company's office in Salt Lake City, has been transferred to the management of the supply department of that company in Los Angeles. Mr. Jones has been for nine years with the Westinghouse office in Salt Lake City. W. A. Moser, formerly an engineering salesman for the company in Salt Lake City, will succeed Mr. Jones.

C. B. Perkins of New York, director of the Pacific Gas & Electric Company, is spending some time on the Pacific Coast. He has been spending a short time in San Francisco recently.

E. G. Waters, general sales manager for the General Electric Company, was a recent Los Angeles visitor. He will include other Coast cities in his trip before returning to Eastern headquarters.

B. M. Maddox, vice-president of Mt. Whitney Power & Electric Company, E. L. Bowler, district manager at Tulare, R. I. Carruthers, district manager at Visalia, R. R. Walbridge, district manager at Porterville, and R. E. Bacon, district manager at Delano, were recent visitors in Los Angeles.

A. D. Page, sales manager of the Edison Lamp Works, and G. C. Osborn, assistant sales manager, together with T. J. McManis, manager of the publicity department, are visiting the Pacific Coast, and will address the agents of the Edison Lamp Works in the Palace Hotel on May 7, 1920.

W. G. Devereux, consulting engineer for the W. C. Duncan Contracting Company, and Wm. H. Mader, of San Francisco, were in Susanville, California, recently for the purpose of examining the tunnel side of the Leon Bly Eagle Lake irrigation project, with a view to entering into a contract for the tunnel construction.

S. C. Haver, Jr., credit agent of Southern California Edison Company, has been appointed employment agent for that organization. This is a new department created for the purpose of handling the employment of all clerical, technical and operative help. The objects of the office are to secure the best man for every job, to improve the personnel in general, to transfer men who have not proven satisfactory to other positions for which they are better fitted, and to relocate men who are apparently inefficient, placing them where they may have another chance, thus saving the expense of breaking in new help and also reducing the labor turnover.

A. C. McMicken, sales manager of the Portland Railway, Light and Power Company, is doing some splendid work for the forthcoming convention of the N. E. L. A. at Pasadena insofar as representation from the Northwest is concerned. Visitors from the North will arrive in San Francisco May 16th at 9:50 a.m. on special train No. 53, and leave for Pasadena at 3:30 p.m. on train No. 110, arriving in Los Angeles at 8:45 the next morning. This will give the visitors from the North time to attend some of the sessions of the Pacific Coast Section, N. E. L. A. Convention, which convenes at Hotel Huntington on that day.

R. C. Smith, up to this time manager of the field photo service department of the McGraw-Hill Publishing Company,

has been transferred to the San Francisco office where he holds the position of advertising manager for the Journal of Electricity. This work was in the past managed by A. H. Halloran, formerly assistant business manager for the Journal of Electricity, now Pacific Coast representative of McGraw-Hill Book Company. During the war Mr. Smith was active in the U. S. Air Service. Since Mr. Smith's duties as



photographic intelligence officer during the war covered the taking of pictures at 6000 ft. elevation, sometimes exhibiting whole cities and towns in one stretch, it is believed that his activities in the future will not only be helpful in supporting the advertising of the Journal of Electricity, but will also help to secure, in later aerial flights, pictures of some of the possible vast water power developments of the West.



**E. O. Eastwood**, professor of mechanical engineering at the University of Washington, is to represent the Pacific Coast states on the national nominating committee of the American Society of Mechanical Engineers which is to assemble at the semi-annual meeting of the society at St. Louis, May 24th and 26th. Mr. Eastwood goes as an alternate for Robert Sibley, editor of the *Journal of Electricity*, who was unable to fulfill this function due to the heavy activities connected with the forthcoming electrical convention of the National Electric Light Association, both of which meet in California practically at the same period the meeting takes place in St. Louis. Professor Eastwood has for many years headed the mechanical engineering work at the University of Washington and is recognized as one of the most able mechanical engineers of the Northwest. The interest he has taken in forming the Seattle Section of the American Society assures the West that it will have an able exponent and champion at the coming gathering.



**Robert L. Watts**, mechanical superintendent for the St. Paul and Tacoma Lumber Company of Tacoma, Wash., is a recent San Francisco visitor. Mr. Watts has had an important part in the electrification of many of the lumber mills in the Northwest and is the inventor of a recent pulley design made by compressing spruce.

**C. D. LaMoree** has joined R. B. Clapp in the firm of Clapp and LaMoree, engineering and sales representatives. Mr. Clapp has been in business in Los Angeles for many years and has taken on many lines of interest to the electrical trade. Mr. LaMoree is an old employe of the Westinghouse Company. They will have headquarters at 406 San Fernando Building, Los Angeles.

**A. H. Patterson**, former vice-president and general manager of Phoenix Glass Company, New York, now retired, is spending a few weeks on the Pacific Coast meeting old friends. Mr. Patterson first visited California in 1875 via stage coach from Portland, Ore. He was at that time a salesman of lighting fixtures.

**W. S. McCormick** has been re-elected senior vice-president of the Utah Power & Light Company. He has held this position ever since the inception of the company. **John C. Howard**, president of the Utah Oil Refining Company, has been named director of the Utah Power & Light Company, **S. R. Inch** has been re-elected vice-president and general manager, and **G. B. Thomas**, secretary and treasurer of the company.

**M. Imai**, consulting engineer for the South Manchurian Railroad of Northern China, is a recent San Francisco visitor. He is making an investigation of high-head hydroelectric power development both in this section of the country and also in Europe.

**Charles R. Crane**, United States minister to China, passed through San Francisco last week on his way to the Orient. He addressed the San Francisco Commonwealth Club on Tuesday noon, April 27th, where he gave a most satisfactory review of social and economic conditions in Russia, Syria and China. He asserted that his instructions from the President were full and complete. Mr. Crane was sent three years ago as a member of the President's special commission to Russia and from his experience there was able to explain many interesting facts in connection with the eastern situation. The ambassador sailed for the Orient on the 29th of April.

**R. Q. Cleavenger** of Phoenix Glass Company is again on the Pacific Coast.

**F. E. Johnson**, vicepresident of the M. W. Kellogg Company of New York, is a recent western visitor in the interests of his company, which is supplying the needs of some of the large Western power projects.

**D. C. Henny**, consulting engineer of the Reclamation Service, stopped in San Francisco recently on his return trip to Portland. Mr. Henny has been attending a business conference in Chicago.

**C. E. Grunsky**, San Francisco consulting engineer, has returned from Chicago where he attended the meeting of the board of directors of the American Association of Civil Engineers.

**W. L. Goodwin**, who is now on his way to California, will deliver addresses in San Francisco on May 5th and in Los Angeles May 7th on the Goodwin Plan. He intends to spend the month of July on a vacation in the mountains of California. **Samuel Adams Chase** will also address both meetings.

**R. P. Askue** has severed his connection with the publicity department of the National Lamp Works to go into agency work with headquarters at Cleveland, Ohio. Mr. Askue had been with the National Lamp Works for several years, prior to which he was advertising manager for the Ivanhoe Regent Works of General Electric Company.

**I. J. Shulsinger** is now advertising manager of the National Metal Molding Company of Pittsburgh. Mr. Shulsinger, who has had several years' experience in electrical advertising, is considered an authority on the merchandising and advertising of electrical appliances and supplies. He was formerly with the McGraw-Hill Company, resigning this connection to take up his new work. While with McGraw-Hill he gave special attention to the preparation of advertising campaigns for advertisers in electrical merchandising. He was also at one time a member of the advertising department of the Western Electric Company.

**W. S. Van Winkle** has been elected president and general manager of the Bay Point Electric Light & Power

Company of Bay Point, Cal. Mr. Van Winkle graduated from the University of California with the class of 1912 and for some years was in the commercial department of the Great Western Power Company with headquarters in Oakland, Cal. For the past two years and a half Mr. Van Winkle has been actively engaged in engineering and managerial matters for the Bay Point Light & Power Company and as a consequence this new promotion comes as no unexpected surprise.

While this company is a small one, yet it is believed that the opportunities for vision and executive control will grow with the live and active community in which this company is located.



#### OBITUARY

**Theodore N. Vail**, chairman of the board of directors of the American Telephone and Telegraph Company, died at Johns Hopkins Hospital recently. Mr. Vail was the head of the largest telephone system in the world. He was from the first the genius that promoted the popular use of the telephone, the first man to establish long-distance communication by telephone, and when past 70 years of age he was still the initiative head of a system that numbered 9,000,000 telephone subscribers and represented an investment of a billion and a half dollars.



## Meeting Notices for Electrical Men

(Never before has the West been able to announce a list of electrical meetings such as the ones which are scheduled here for the month of May. Plans for the A. I. E. E. convention, the convention of the National Supply Jobbers' Association, the Foreign Trade convention and the N. E. L. A. conventions, make the following pages of greater interest than ever before to every man of the electrical industry.—The Editor.)

### Meeting of San Jose Contractors and Dealers

At the regular April meeting of the Electrical Contractors and Dealers' Association of San Jose, delegates were appointed to attend the meeting of the state association at Visalia, on April 24, and plans were discussed with the idea of securing a meeting of the California State Association of Electrical Contractors and Dealers in San Jose in the near future. Mr. R. L. Smith, field representative of the California Electrical Cooperative Campaign in the bay district, was introduced to the members and gave them a short talk on what the campaign is trying to do for them and offered his assistance in any way possible. He finished with a plea for a more hearty cooperation between the contractors and the field representatives.

It was unanimously decided by the association to install the best fixtures possible on every job, and always to install fixtures suited to the particular lighting conditions at hand. The meeting was well attended. The members showed a great interest in all of the proceedings and evidenced a desire to make the very most out of their association and to raise the standard of their business in every possible way.

### Electrical Day at the Los Angeles Ad Club

A recent meeting of the Los Angeles Advertising Club was made the occasion for the reception of members of the Electrical Cooperative League who have discontinued their separate organization and have formed an Electrical Section with the advertising men.

K. E. Van Kuran, district manager for the Westinghouse Company, acted as chairman of the day and was introduced by Ralph B. Clapp, formerly president of the Electrical Cooperative League. Among the guests of honor were J. G. Pomeroy, manufacturers' agent; Wm. Baurhyte of the Los Angeles Gas and Electric Corporation; H. L. Harper of the Western Electric Company, and Messrs. G. C. Ward, A. N. Kemp and S. M. Kennedy of the Southern California Edison Company.

R. H. Ballard, general manager of the Southern California Edison Company and president of the National Electric Light Association, spoke on "Electrical Development, the Future of California," stating in part:

"Our ability indefinitely to increase our own productiveness is the greatest asset which we have to advertise. The electricity generated from the gravity waters as they rush down from the high altitudes of our mountain watersheds is the force behind our ability to bring hundreds of thousands of acres of negligible lands under intensive cultivation and to make the southwest a great and permanent manufacturing center, because we can guarantee that our power cost will always be lower than that of any other section of the country and will not be jeopardized by the diminishing supply of coal and oil, which is already menacing other parts of the country.

"In California there is about one million horsepower of hydroelectric energy developed. Six million horsepower is waiting to be developed from the waters of the state and there is a market for every kilowatt-hour that can be produced."

Frank C. Tyrrell, a local attorney, spoke in place of Robert Sibley, editor of the Journal of Electricity, who had been scheduled to present the subject, "\$250,000,000—How You Will Help Do It," but was unable to attend the meeting. Mr. Tyrrell gave a powerful address, showing how industry as a whole must support the program of electrical development in the state to insure our continued prosperity.

### Electrical Credit Association

At the fifteenth annual meeting and dinner of the Electrical Credit Association of the Pacific Coast, held in San Francisco on April 15th, R. J. Holterman, manager of the Holabird Electrical Company, was elected the new president. The other officers elected were: J. J. O'Reilly, first vice-president; H. C. Chapman, second vice-president; S. W. Murray, third vice-president; A. H. Elliot, secretary-treasurer; John Bray, H. J. Zweifel, R. J. Holterman, F. A. Morton, J. H. Levenson, executive committee; S. B. Anderson, representative to the National Electric Light Association.

The retiring president, H. J. Zweifel, presided during the business session, which consisted of reports from the auditing committee, C. W. Goodwin, Jr.; report of secretary-treasurer, A. H. Elliot; and of the nominating committee, J. T. Gates. The toastmaster, A. H. Elliot, introduced the following speakers: L. J. Brown, assistant sales manager, Western Elec-

tric Company; R. J. Holterman, manager Holabird Electrical Company; C. W. Banta, vice-president Wells Fargo Nevada National Bank; C. E. Listenwaller, Listenwaller and Gough, Inc., Los Angeles; and F. P. Vose, secretary National Credit Association.

There was a spirit of the greatest optimism prevalent at the meeting, which concludes the eighteenth year of the existence of this association. At the present time there are thirty-two full members and six half-members of the association.

### Power Administrator Addresses Electrical Development League

The optimistic note struck by H. G. Butler, power administrator of the California Railroad Commission, at the regular Monday noon meeting at the Palace Hotel of the San Francisco Electrical Development League on April 12, brought encouragement to the men of the industry and the Purchasing Agents Association, who were their guests. After being

### BUILDERS OF THE WEST — LXXVI



DR. DAVID P. BARROWS

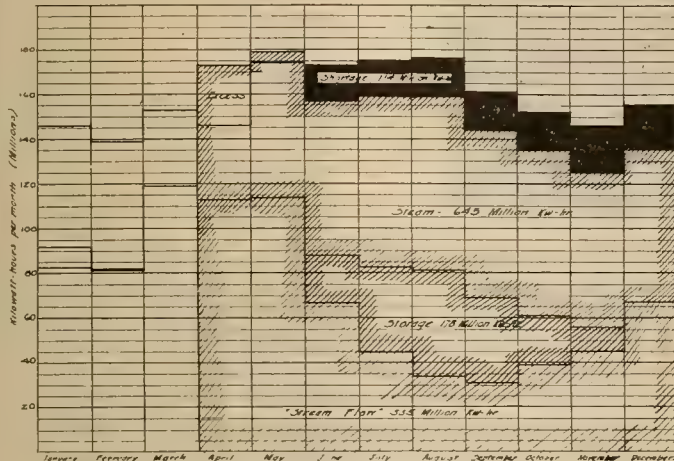
The spirit of the educational centers of the far West which in its message of cheer and inspiration has done so much to cement Oriental friendships is closely allied with the purposes of the Foreign Trade Convention soon to open its sessions in San Francisco. To Dr. David P. Barrows, president of the University of California—with its ten thousand students the largest institution of its kind in the world—this issue of the Journal of Electricity is affectionately dedicated in lasting appreciation of his service to the West in giving to the young an inspiration and confidence for the future, and for his effective service in pointing out to them what the West has in its native values to contribute to the upbuilding of humankind.



formally introduced by Mr. J. E. Woodbridge, consulting engineer for the Southern Sierras Power Company, Mr. Butler began an analysis of the power situation as it now stands and produced a chart which showed the probable demand, the available power from steam and hydro plants in the state, with a shortage shown of 114,000,000 kw-hr. To meet the present power and water situation Mr. Butler said, in part:

"No definite plans for this year have as yet been made. The plans to be made will depend on the conditions when it becomes necessary to use stored water. All that has been done so far is to prepare to secure as much power as possible, to attempt to keep the rice load within bounds and to urge farmers, through associations and organizations, to plan to do their irrigating at night, as far as possible, after May first.

"Stored water will be used to equalize the shortage over the seven months during which the shortage will prevail. This method of using stored water also works out best for irrigation as the water will be withdrawn when needed for crops. The shortage, based on the estimated demand, which is from 6% to 8% greater than for the corresponding



PROBABLE POWER SHORTAGE

Chart used by Power Administrator H. G. Butler to show probable shortage. The figures on this chart, Mr. Butler pointed out, are only approximate as late spring rains or early fall rains would change all of them.

months last year, will be 114,000,000 kw-hr. for seven months, or about ten per cent.

"In the northern part of the state this is the third consecutive dry year. It is difficult to estimate the stream flow, but a closer estimate may be made of the stream flow which will be important. Indications are that the Pacific Gas & Electric Company will have 10,000,000 kw-hr. more than last year but will not fill its upper reservoirs. Lake Almanor of the Great Western Power Company will be only forty per cent full. Steam is a very uncertain factor. To carry out their part of the program as much as 77,000,000 kw-hr. per month will have to be generated, while the best the same plants have ever done before was 64,000,000 kw-hr. in August of last year.

"The precipitation in the southern half of the state has been nearer normal than in the north and the supply of energy is proportionally greater. The San Joaquin Corporation has been face to face with a power shortage since 1918 and has not taken on an extensive load, and the Southern California Edison Company has also been careful on new business. The watersheds of the hydro plants are higher than those of the north and it is more difficult to estimate what the water supply will be, but I firmly believe that it is safe to say that if the agricultural and other loads can be shifted from day to night, no extensive new load taken on, and the resources are carefully husbanded, it may be unnecessary to place power restrictions on the south."

Pointing out eleven big construction projects that are actually under way, with a capacity of 208,000 kw., Mr. Butler went on to say:

"All but 10,000 kw. of this, or 198,000 kw., will be available before the low water next season and there are other plants in contemplation which could be finished by this time. Of this 76,500 kw. is in the northern district and the interconnection between the South and North is too light to permit of an interchange of power sufficient to make the new plants of the South available for the North. Still, with a normal supply of water there should be no power shortage next year. The more distant future is safe if the power companies definitely realize, and I think they do, that they must think in terms of hundreds of thousands of kilowatts and tens of millions of dollars. But even so it will be a severe strain to finance and build the power plants necessary to make our water resources available to the manufacturers of the East, who will seek them in increasing numbers as the fuels become more and more exhausted and more and more expensive. The Goodyear Rubber Company, in my opinion, is only the advance guard of those manufacturers, and that company alone, when it reaches full completion, will take 100,000,000 kw-hr. per year, or three and one-third per cent of the total 1919 output of practically all the plants on the Pacific Coast between Oregon and Mexico.

"When the proposed interconnection is made in the very near future, there is no system of interconnected companies in the world which will compare with it in magnitude. Nearly 100 plants will be tributary to it and consumers who use over 10,000,000 kw-hr. daily during the summer will be supplied from it. The output of these plants in 1919 was 3,300,000,000 kilowatt-hours."

### Convention in Texas

The annual convention of the Southwestern Electrical and Gas Association will be held in Galveston, Texas, May 15th. Several matters of importance, including action by the electrical section of the association on the question of joining the Southwestern Geographic Division of the National Electric Light Association, will come up at the convention. Executive Manager M. H. Aylesworth and Treasurer H. C. Abell of the association expect to attend and address the convention on the work of the N. E. L. A. and the advantages to be gained by membership therein.

### A. I. E. E., Pacific Coast Convention

The Pacific Coast convention of the American Institute of Electrical Engineers will be held in Portland, Oregon, July 21, 22 and 23. The Multnomah Hotel will be the convention headquarters and the business sessions will be held in one of its ballrooms.

The morning session on Wednesday, July 21, will be devoted to general business, and to a paper by W. D. Peasley of the Jeffrey-DeWitt Insulator Company on "High Tension Insulator Design." At the afternoon session a paper by Professor Harris J. Ryan of Stanford University will be presented. This will deal with the electrical essentials required for the use of standard cap and pin type insulators for supporting long 220-kv. lines. A paper on "Power Factor Correction," by some member of the engineering staff of the General Electric Company, will also be presented at this time.

On Thursday morning Mr. Beeuwkes, electrical engineer of the Chicago, Milwaukee & St. Paul Railway, will read a paper on "Railway Electrification." At the afternoon session a paper on "Hog Fuel, Fuel Oil and Pulverized Coal" will be presented by some member of the engineering staff of the Charles C. Moore & Company. In the evening the guests will be taken for an automobile tour over some of Portland's scenic boulevards.

A paper by some member of the engineering staff of the Pacific Telephone & Telegraph Company, on "Bridge Methods for Alternating Current Measurements," and a paper by the chief engineer of the Maryland Pressed Steel Company, on the use of special steel in pressed steel transmission line fittings, will be presented Friday morning. Friday afternoon will be devoted to a golf tournament, competing for a



Lobby of the Multnomah Hotel, Portland, Oregon, where the Pacific Coast A. I. E. E. convention will be held, July 21-23. Five important business sessions will be held in the ballrooms of this hotel.





Shepherd's Dell on the Columbia River Highway, which will be seen during one of the trips planned in connection with the Pacific Coast Section A. I. E. E. Convention. A number of tours have been included in the convention schedule so that every delegate will have an opportunity to see all points of interest around Portland, including many of the big hydroelectric plants of the Northwest.

cup offered by Vice-President Fisksen. For those not interested in golf, a trip up Columbia River Highway has been arranged. Both parties are to meet in the evening for dinner at the Crown Point Chalet.

Saturday, July 24, will be devoted to trips taking in various points of interest in and around Portland. These trips will probably include the hydroelectric plants of the Portland Railway, Light and Power Company and the Northwestern Electric Company, the new steam generating station of the Northwestern Electric Company, the Inman-Poulsen sawmill, the new municipal terminal and grain elevator at St. Johns, the electric brass furnaces of the Oregon Brass Company, and various other points of interest.

The foregoing, of course, is a tentative program and subject to change. Nevertheless all of the papers mentioned have been definitely promised and all plans indicate that great things in the realm of work and play are in store.

#### President Barrows Addresses Development League

At the regular meeting of the San Francisco Electrical Development League, at the Palace Hotel on April 26, President David P. Barrows of the University of California addressed the meeting on the subject of Mexico. Mr. Barrows was introduced by Dr. Thomas Addison, Pacific Coast manager of the General Electric Company.

One of the features of the meeting was a large table at right angles to the speakers' table, at which the alumni of the University of California sat and during the meal broke out into the old songs and cheers of their alma mater. Another innovation was the appointment of a Chairman of Fines. To Garnett Young, of Garnett Young & Company, fell the honor of being the first to hold this office.

In speaking of Mexico, Dr. Barrows dwelt on the economic possibilities of the country and laid most of the blame for the present unsettled conditions to the impossibility of securing a fair election. He brought out the fact that the world needs the resources of Mexico, especially at the present time when the peoples of Europe are in need of many of the products which Mexico could supply. Dr. Barrows explained the change in the policy of the United States from the time of the Boxer uprising in China, when the United States rushed in to extricate its citizens from Peking, to the present policy of the administration towards those Americans who are in Mexico today.

#### Papers Committee Meeting

At the recent meeting of the Papers Committee of the

Pacific Coast Section, N. E. L. A., it was decided that at the forthcoming convention to be held in Pasadena on May 17th there would be but a single day's session. This meeting will be opened at 9 a.m., the first hour being devoted to the president's address, reports of the secretary, the treasurer, the various committees, etc. From 10 a.m. to 12 m. the various committees will hold separate sessions to discuss such papers as appeared to be of interest to the individual committees and not of particular interest to general membership.

At 1:30 p.m. there will be a general session to discuss Mr. Woodbridge's paper on Railway Electrification, and such other papers as the time will permit. At 4:30 p.m. the closing business session will be held. Thus it will be seen that there will be but two hours for the discussion of engineering papers.

Consideration was given to the selection of subjects to be discussed at the engineering session. The paper by Mr. Armstrong on "Relay Protective Systems" was suggested. In addition to this paper, it has been suggested that some time be devoted to a discussion of the question of "Method of Improving Power Factor of Consumer's Apparatus by Rate Schedules."

#### FOREIGN TRADE ADDRESSES

Among interesting addresses listed for the Foreign Trade Convention, San Francisco, May 12-15, are the following:

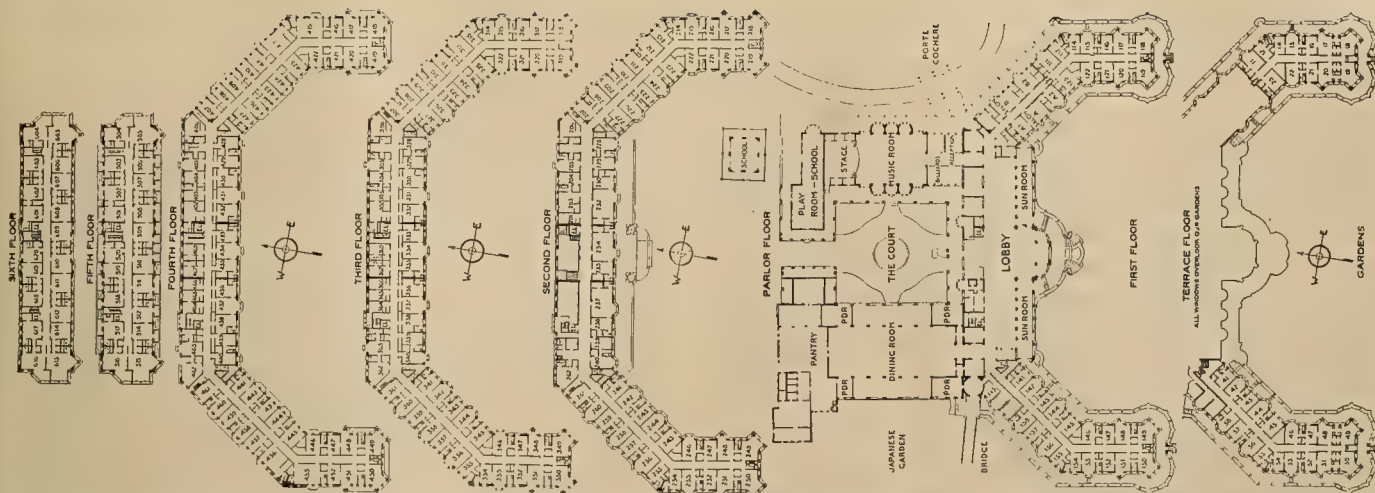


Sticker used by the Foreign Trade Councils to advertise the 1920 Convention.

- "Foreign Exchange": Fred I. Kent, vice-president Bankers' Trust Company.
- "Port and Terminal Facilities": B. F. Creson, Jr., New York-New Jersey.
- "The Relation of Our Productive Capacity to Our Foreign Trade": James A. Farrell, president U. S. Steel Corporation.
- "Foreign Trade in Railway Supplies": Frank Noxen, Railway Supply Association.
- "The Service of the Business Press": James H. McGraw, The McGraw-Hill Corporation.
- "The Importance of Foreign Credits": Henry S. McKee, vice-president Merchants National Bank, Los Angeles.
- "Fuel Oil and Foreign Trade": A. C. Bedford, Standard Oil Co. of New Jersey.
- "Survey of New Markets": E. Wilhelm Drost, the Robbins and Myers Company.
- "Commercial Interchange with China": John Foord, American Asiatic Association.

These are only a few items from a program which is of the greatest interest to the electrical industry as well as to the country as a whole.





Above is the floor plan of the Hotel Huntington, Pasadena, which is to be the headquarters of the N. E. L. A. Convention. The regular joint sessions will be held in the Music Room on the first floor while special sessions will be held in several smaller rooms. It is rumored that at various unexpected times bewitching dancers and serenaders will appear in the sunken Japanese gardens which surround the hotel.

## N. E. L. A. Conventions—May 17th-22nd

(Those who have already planned to attend the N. E. L. A. Convention will be interested in the following announcements concerning transportation, registration and N. E. L. A. organization plans which are to be considered in Pasadena, and those who have not not already planned to attend convention will perhaps be spurred on to make the convention decision by this page.—The Editor.)

### CONVENTION ENTERTAINMENT FEATURES

Charlie Murray, the Mack Sennett comedian of Celtic persuasiveness, has accepted the responsibility of being master of ceremonies at La Fiesta de Electra, which will be the culminating entertainment feature of the N. E. L. A. Convention to be held at the Hotel Maryland on Friday night, May 21st.



Charlie Murray, who is to be the charming toastmaster of La Fiesta de Electra.

On the great staircase leading into the lobby of the hotel there will be novelty pictures and performances appropriate to the festive occasion and Mr. Murray stakes his professional reputation in reiterating the slogan of the old time showman that it will be the "greatest show on earth."

It is expected that upwards of three thousand guests will be entertained at

the Fiesta de Electra and at least ten novelty acts will be produced by motion picture stars and comedians who are the makers of spontaneous mirth and photo drama thrills of the world.

To make it possible for the delegates who visit the convention of the National Electric Light Association at Pasadena, May 18th to 21st, to see every feature of Southern California life within the shortest space of time, with the greatest possible convenience, and by special arrangements such as are not obtainable by the individual tourist, is the aim of Entertainment Chairman W. L. Frost.

### Santa Catalina Island

He has completed plans for a trip to Santa Catalina Island, the magic island of the Pacific, which lies twenty-six miles from the mainland, and is the mecca of pleasure seekers and fishermen the world over. A large new steamer will be put into service just previous to the convention, and Chairman

Frost anticipates that enough of the visitors will wish to make the Catalina trip so that the new boat can be chartered for their exclusive use.

Santa Catalina Island is the fishing grounds of the tuna, the game fish that swims, and it is the home of the Tuna Club, which has a membership extending all over the world.

### Filmland

Another of the trips already arranged is one through "Filmland," or the motion picture studios, some sixty of which are located within easy ride of Hotel Huntington. These studios are ordinarily closed to the public, as the producers figure that the delay caused to the working of actors and camera men figures fifty dollars net loss for each visitor who is admitted. The entertainment committee has overcome this obstacle and has arranged that the delegates be shown through the studios and be permitted to see the actual stage work upon the sets, and learn the part electricity plays in the art of motion picture photography. Among the studios which will welcome N. E. L. A. delegates are the Lasky, the Metro, the Universal, the Charley Chaplin, the Goldwyn and the Ince studios, and the studio where Mary Pickford and Douglas Fairbanks stand before the camera.

If you are planning a vacation, Take it at Pasadena, May 17-22

If you have no time for a vacation, Come work with us for the good of the Industry.

If you are wondering about the future of the public utility under regulation, Hear Mr. Carl Jackson, chairman of the Wisconsin Railroad Commission, on "Trend of Regulation," and Mr. E. O. Edgerton, President of the California Railroad Commission, on "Reward for Efficiency."

Are you familiar with the plans of your national association to bring about a better understanding between the Regulator, the Public and the Public Utility?

If not, Come to Pasadena and take part in the discussion of executive dealing with this important question.

MAY 17TH TO 22ND



### Other Points of Interest

There will be trips to all of the famous beach resorts which extend for miles along the Pacific Coast, and trips by trolley and automobile through the "Orange Empire."

### Aeroplane Taxi

Arrangements are now under way for an aeroplane "taxi" service, and it is hoped that a landing field can be established near Hotel Huntington so that guests can fly over the beautiful valley and foothills and back to the hotel, without taking much time from the serious deliberations of the convention. Engineers, technical men and others who desire to visit the great hydroelectric properties of the power companies of the Southwest will be provided with automobiles and guides for excursions into the mountains.

## CHANGES IN N. E. L. A. ORGANIZATION

### A Letter to the Editor

Last night I looked over the April 1st edition of the Journal, and was so impressed with it, that I am constrained to write you and extend my congratulations as well as my official and personal appreciation and gratitude for the manner in which you are handling the National Electric Light Association Conventions. The two pages devoted to the National Electric Light Association are very impressive.

Under the direction of Mr. M. H. Aylesworth, executive manager, the headquarters office of the association has been thoroughly reorganized, and some new men have been brought in. They have now a departmental organization very similar in character to the organization of public utility companies. The general office routine is in charge of Mr. S. A. Sewall, acting secretary; all committee work in charge of the committee secretary, Mr. A. J. Marshall; a service department has been organized under Fred H. Herbert, who is making himself very useful to member companies; the rate research department has been moved to New York, and under the direction of Mr. Herbert has expanded to be in fact a regular rate bureau for the assistance of member companies; the department of publicity is under supervision of Mr. George L. Oxley, director of publicity; and an engineering department is being organized and we will soon be able to announce the addition to our forces of a prominent engineer to take charge of this department and handle for the association such matters as inductive interference, electrolysis, Bureau of Standards safety codes and rulings.

Our committee on reorganization, under the chairmanship of Vice-President Frank W. Smith, New York, and our committee on constitution and by-laws, under the chairmanship of Mr. Wm. C. L. Eglin, Philadelphia, presented to the executive committee meeting held in New York on the 8th of this month, proposed amendments to the constitution, which

are in fact the writing of a new constitution. The whole matter was formally and enthusiastically approved by the executive committee for presentation to the convention at Pasadena. Some general information concerning these changes, I think, will interest you. Quoting from the report:

"The Pyramid Plan of Organization is probably too well known to make necessary a detailed explanation of its principles. It probably will suffice to state that the base of the pyramid—the foundation of the association—will rest on and cover the entire country, thus making the association truly national and democratic in scope, thought and action.

"Geographic Sections: It is proposed to create officially thirteen geographic sections with the constitution of the National Electric Light Association so framed as to permit of any revision which experience may prove to be necessary. The activities and organization of these geographic sections will in turn be coordinated with the national.

"Without in any way attempting to usurp the prerogatives of existing state organizations, an effort will be made to assist such organizations to more highly developed, organized and related activities by establishing through a sympathetic and effective organization, contact and co-operation with adjacent state organizations. By working with and clearing through the proposed thirteen geographic sections, the National Electric Light Association becomes actually and truly national and democratic in scope, assuring prompt and intelligent treatment of every problem peculiar to each and every section of the country.

"National Executive Committee: Membership of the association is of course the controlling factor and elects the governing body, namely, the national executive committee, consisting of the president, retiring president, four vice-presidents, treasurer, and presiding officers or other duly accredited representatives of the proposed thirteen geographic sections, the chairman of each of the proposed national sections, and nine members at large, six of whom shall be chosen from Class A or Class B members and three from Class D or Class E members. This is adopting nationally the change made in the Pacific Coast Section at Riverside and permits of representation on the executive committee of others in the industry besides central station companies.

"An entirely new feature: public relations national section. The structure, personnel and method of operation of this proposed section is identical with the other proposed three national sections (commercial, technical and accounting), excepting that the public relations national section in addition to its representation on the national executive committee will have definite contact with the national public policy committee by means of seven members of the executive committee of the public relations national section serving on the national public policy committee, which seven members will be recommended by the chairman of the public relations national section, endorsed by the chairman of the national public policy committee and approved by the national executive committee.

"In order to provide machinery for the operation of the reorganization plan as previously broadly described, there is in course of preparation a 'Guide' for the operation of geographic sections, state organizations and company sections, intended not as a cut-and-dried plan of procedure, nor a codification of rules and regulations, but merely an orderly arrangement of notes and suggestions which indicate a way to successfully conduct such operations without entailing any loss of time or effort, and thereby promoting cooperation, coordination and efficiency in the work of the entire association. These 'Guides' are purely suggestive in character and may be modified (insofar as such modifications do not conflict with the constitution of the National Electric Light Association) to suit the requirements of any geographic section, state organization or company section. Copies of this 'Guide' will be available upon request by geographic section, state organization or company section officials.

"The object sought in the reorganization proposed is to provide thorough and complete democratic representation of all parts of the country and all phases of the electrical industry in the management and activities of the National Electric Light Association, and to so relate all interests and to so systematically coordinate all activities involved, that the results desired will be secured with the minimum expenditure of time, money and effort—the entire electrical industry going forward in unison."

I received this morning the following telegram from the Executive Committee:

"At a very successful meeting today we fully discussed and recommended the new constitution along the lines of the policies inaugurated by you and adjourned to meet you at Pasadena at the national convention on May eighteenth."

R. H. BALLARD.



In 1911 Del Monte was the scene of the convention of the Electrical Supply Jobbers' Association and at that time the above records of the delegates held this year, May 12-14. A comparison of fashions then and now cannot



## HAPPENINGS IN THE INDUSTRY

### COLORADO RIVER IS CONVENTION SUBJECT

For the purpose of seriously studying the possibilities of the Colorado river drainage basin and taking definite action along practicable lines, the League of the Southwest held a convention in Los Angeles April first to third. The importance of the subject is indicated by the number of prominent men attending and the interest shown in purely technical topics presented from time to time.

No less than fifty men of national reputation attended the meeting and the list of speakers included Governor Stephens of California; Governor Campbell of Arizona; Governor Davis of Idaho; Governor Larrazolos of New Mexico; Governor Bamburger of Utah; W. J. Bryan; Miss Helen Taft, daughter of former President Taft and acting president of Bryn Mawr; Senator Owen of Oklahoma; E. C. La Rue, government engineer and an authority on the Colorado; John T. Whistler, engineering adviser of the Federal Farm Loan Bureau; C. E. Grunsky, former Panama Canal commissioner; F. E. Weymouth, chief of construction of the United States Reclamation Service; Victor E. Keyes, attorney-general of Colorado; E. O. McCormick, vice-president of the Southern Pacific and Dr. Kleinsmid, president of the University of Arizona and president of the League.

The watershed feeding the Colorado river includes nearly all of the state of Arizona, about one-half of Utah, a large portion of Colorado and substantial parts of Wyoming, Nevada and New Mexico. A comparatively small strip in California is also included. This immense basin drains 265,000 sq. mi. and dominates over six million irrigable acres.

At the final meeting of the convention Gov. Campbell of Arizona was elected President of the League of the Southwest, Frank A. Gesell, vice-president and Arnold Kruckman, secretary.

The convention closed with the unanimous adoption of the resolutions drafted by a committee headed by Judge Richard E. Sloan of Arizona. The resolutions are given below in full as they represent a positive step which may be of tremendous importance to the future of the Pacific Coast and, further, because they embody definite plans which will be of interest to readers of the Journal of Electricity:—

"The Convention of the League of the Southwest, composed of delegates from the States of California, Colorado, Arizona, New Mexico, Nevada, Utah, Wyoming and Idaho, in conjunction with engineers, scientists and men eminent in the affairs of the whole nation, assembled in the city of Los Angeles, Cal., April 1, 2 and 3, 1920, view the plan of control and development of the Colorado River, as outlined by the Reclamation Service of the United States and the able papers presented to this convention, as one most essential to the growth and development of

the West, and as furnishing means for the future prosperity of a great many citizens of the United States of this and future generations. The vastness of the project is such that many years will be required before it can be brought to completion in all its details.

"Whereas, it has been shown by the investigations of the government that a great dam may be constructed at or near Boulder Canyon on the Colorado river, as proposed by ex-Secretary Lane, adequate to control the destructive floods of the Colorado river and of sufficient capacity to supply water for the irrigation of 1,500,000 acres of land in addition to that now under irrigation, with a productive capacity of \$150,000,000 in wealth annually, with a livelihood for over 1,000,000 of our population;

"And whereas, the power available from this reservoir will be sufficient to supply the necessary electrical energy for large portions of the states of California, Utah, Nevada, Colorado and Arizona;

"And whereas, the storage of water at this site will not in any way interfere with the further development of the river in the upper portions of its drainage basin;

"Now therefore be it resolved: That the United States Reclamation Service be requested and urged to proceed with diligence with its investigations of this site, with a view to its very prompt construction;

"Resolved: That Congress is hereby requested to appropriate the sum of \$50,000 for the use of the Reclamation Service in completing the investigation of the Boulder Canyon reservoir site, and that such appropriation be made available at once.

"And whereas, the withdrawal from entry of the Ouray reservoir sites in Utah, which would inundate and render useless 250,000 acres of land, including several small towns and 20,000 acres of Indian allotments, and which prevents the building of a through line of railroad from Denver to Salt Lake City, that is vital to the interest of northeastern Utah and northwestern Colorado, this reservoir site should be abandoned, that the essential right of way may be granted and development assured to one of the largest and richest mineral and agricultural sections of the Colorado basin;

"Now therefore be it resolved: That we recommend the abandonment of the Ouray reservoir site unless it shall be shown that such site is absolutely essential to the general development of the Colorado river.

"Be it further resolved: That it is the sense of this convention that private projects which do not conflict with the proposed general plan of the Colorado river should be permitted to proceed with the fullest cooperation of the government, and that a liberal policy should be adopted toward such private enterprises;

"Be it further resolved: That in carrying out the plans of the Colorado river project, due consideration should be given entrymen and settlers who have been hindered in their efforts to obtain water for their claims, and that they should be given such reasonable time as may be necessary to complete their proofs.

"We further recommend that no public lands be withdrawn from entry, or if already withdrawn, that no such lands be withheld from entry and settlement, except those proved essential for the project.

"It is further resolved that the President of the United States be requested to take the proper steps, through diplomatic channels to secure—if possible—the establishment of joint control, by the governments of Mexico and the United States, of the waters of the Colorado river diverted by natural conditions through a portion of the republic of Mexico and again entering the United States, to the end that all levees, irrigation works and canals, constructed for the control of such waters may be properly maintained and protected;

"Be it further resolved: That the governors of the states represented in the League of the Southwest constitute a permanent committee and as such be empowered to take such action as they may deem necessary and proper to make effective the suggestions embodied in these resolutions; and for that and the general purposes of the league, they are severally requested to obtain, if it be possible, such financial aid as may be needed from their respective states.

"Whereas, definite results in pooling the water resources of the Colorado basin and arranging a working program can only come through full presentation and study of all engineering data pertaining to irrigable acres, reservoir sites, power sites and water supply of each state:

"Resolved: That to this end a permanent engineering commission should be formed consisting of the state engineers of the several states and engineers of the United States Reclamation Service to study the basin as a whole and prepare a comprehensive plan for immediate action and early development."



gates were taken. Undoubtedly many of these same members of the association will be present at the second Del Monte convention which is to but be interesting to any member with a sense of humor or an eye for progress.



## NEW ELECTRICAL DEVELOPMENT

(The completion of a new \$100,000 steam plant, appropriations for city lighting purposes and plans for the construction of a large reservoir are reported among Northwest items. Hydro-electric development in Shasta, Lassen and Modoc counties is included among other news of the Pacific Central district, while bond election reports come from both Arizona and Southern California. A number of items concerning public utility activities are among those from the Intermountain district.—The Editor.)

### THE PACIFIC NORTHWEST

**SEATTLE, WASH.**—Ordinances have been introduced in the city council appropriating \$8000 and \$150,000 for the city lighting department.

**SALEM, ORE.**—Oregon Electric Company will make improvements in the city to cost \$10,000.

**SEATTLE, WASH.**—Stone & Webster division of construction and engineering has closed its Seattle office and Messrs. Shannon and Roberts, members of the force, are awaiting orders.

**BEND, ORE.**—The Bend Water, Light and Power Company has completed entirely successful tests of their new one thousand-kilowatt \$100,000 steam plant here.

**SEATTLE, WASH.**—The city of Seattle has officially approved the new sixteen-mile steel pipe line from Molasses Creek to Volunteer Park reservoir. The cost is estimated at three million dollars.

**SALEM, ORE.**—The Oregon Pulp and Paper Company has purchased from the Ladd interests of Portland, the north power site on the North Mill Creek for one hundred thousand dollars. The power is to be used in the manufacture of paper.

**COUPEVILLE, WASH.**—W. C. Cheney, who built and put in the electric light plant here in the fall of 1915, has sold the plant to Coates & Son who will operate it from their works at Prairie Center on Ebeys Prairie. The new owners are putting in new poles for various customers on the Prairie.

**TACOMA, WASH.**—St. Paul & Tacoma Lumber Company have ordered a 2500-kw. steam turbine unit through the Seattle office of the Allis-Chalmers Manufacturing Company, which will be used in completing the electrification of its mills at Tacoma. A 1000-kw. machine has been in operation at the mills for some time.

**SEATTLE, WASH.**—Nepage, McKenny Company, electrical engineers, contractors and manufacture, Armour Building, Seattle, report considerable activity in their lines. Among the contracts recently secured are: complete installation of electrical equipment in the addition being made to the Arcade Building, Seattle; Rhodes Brothers Building at Third and Virginia streets; new building of the Gair Realty Company at Westlake & Republican streets, also the new building of the same company at East Union and Broadway, to be occupied by Western Motors Company. Installation of complete electrical equipment in the new store building of E. S. Keith, Bremerton, Washington, will also be made.

**SALEM, ORE.**—Application for permits to construct a reservoir and divert large quantities of water for development of hydroelectric power have been filed by J. G. Kelley, 516 Chamber of Commerce Building, Portland. The site of the reservoir and power house will be in the Santiam National Forest, Oregon. Work is not anticipated in the near future. Marion Lake will be enlarged for the storage of 38,155 acre-feet of water, according to plans filed, and the dam will be 75 feet high, 500 feet long at the top and 50 feet at the bottom. A 30-inch steel pipe is to be placed through the base of the dam and there will be a tunnel up to ten feet in diameter, with 96-inch steel pipe at the intake, estimated cost to be \$125,000. The de-

velopment of 26,636 theoretical horsepower is contemplated from the diversion of 160 second-feet of water from Marion Lake, Puzzle Creek and Whiskey Creek. There will be a canal system of wood stave pipe seven feet in diameter, forebay, surge reservoir, penstock and power house, all of which will cost \$1,795,000. Applicant also asks permission to divert 600 second-feet of water from north fork of Santiam river for developing 29,000 horsepower. Construction here contemplated is estimated to cost \$2,000,000 and will include a gravity type dam of reinforced concrete, a canal eleven feet wide, forebay, penstock and power houses. No mention of the probable date of beginning or completing construction is made.

### THE PACIFIC CENTRAL DISTRICT

**SAN FRANCISCO, CAL.**—The second contract for six gates for the Hetch-Hetchy dam was awarded by the board of public works to William Crap & Sons at \$173,000.

**ALAMEDA, CAL.**—The contract has been let for the construction of the new substation on Webster street and Atlantic avenue by the Municipal Electric Light Plant. The station will cost \$60,000.

**PETALUMA, CAL.**—The city council opened bids for installing the conduits for electroliers on Main and Third streets and awarded the contract to the lowest bidder, Bauer & Baugh, at \$1,515.

**BELDEN, CAL.**—Work on the development project of the Great Western Power Company near Howell is virtually at a standstill by reason of most of the crew employed quitting work without notice. Between 600 and 800 men are involved.

**ANDERSON, CAL.**—At a meeting of the directors of the Anderson-Cottonwood Irrigation District, May 8th, was the date set for the voting of a new bond issue of \$200,000 to complete the irrigation district and to adequately drain the system.

**ANTIOCH, CAL.**—Construction of a mammoth restraining dam across Carquinez Straits from Bullshead Point, near Martinez, to Army Point, Solano county, to prevent salt water from encroaching on rich agricultural lands in this district is being suggested by farmers and its promotion is being seriously considered.

**RICHMOND, CAL.**—By May 1 the big tunnel aqueduct of the East Bay Water Company, leading from the San Pablo Canyon reservoir through the hills to the western side above San Pablo Avenue, will be ready for operation, according to statements of officials of that corporation.

**REDDING, CAL.**—An all-steel tower line will connect the Pacific Gas & Electric Company's power development on Pitt river with San Francisco bay. A crew of surveyors arrived to begin mapping out the line. Power development work just starting in Shasta county will cost \$3,000,000.

**SAN FRANCISCO, CAL.**—The Pacific Gas & Electric Company plans the expenditure of \$15,000,000 for improvements in 1920. Of this \$3,170,000 is to go to Alameda county district. A new gas generator set and improvements at Station B call for \$215,000. A 2,000,000-ft. gas holder is to be built in Berkeley, and \$45,450 has been authorized to construct a new 11-kv.

line from First and Grove to Station D, Fifty-first and Shattuck. It will be a 4-0 cable underground to Twenty-seventh and Grove streets.

**OROVILLE, CAL.**—Delegates representing nine irrigation districts in northern California, comprising 282,000 acres of land, declared for the full development of water in the northern part of the state for northern California land, and organized the Association of Northern California Districts. Officers will be elected and by-laws adopted at a meeting to be held in this city May 8th.

**OAKDALE, CAL.**—The Oakdale irrigation district will be forced to condemn the site for its proposed \$2,000,000 dam, the district and the Caleveras Copper Company, owner of the Melones dam, being far apart on their negotiations, which have been broken off. The copper company asks \$250,000 for its site alone. The irrigation district has offered \$6,000. The company also wants certain concessions.

**WOODLAND, CAL.**—Work was started on the construction of an \$80,000 steam power plant by Reclamation District 108 at Knights Landing. The plant will supply power for irrigation in the Wilkins Slough and Boyer's Bend districts. The electricity will be carried over the wires of the Pacific Gas & Electric Company. The plant is to be installed on account of the power shortage. Twenty thousand acres are in rice in the district this year as against 7,000 acres last year.

**VALLEJO, CAL.**—Commissioner R. O. Pierce returned from an inspection of a water supply north of Napa, just this side of Mount George, which he believes will eclipse any proposition thus far inspected by Vallejo. Mr. Pierce says a vast store of water from Millican Creek is running to waste and can be obtained by the construction of a pipe line 22 miles long. It is the only creek in Napa county that is running any volume of water at present. Mr. Pierce believes the supply is capable of producing three million gallons of water a day the year round.

**SAN FRANCISCO, CAL.**—Pacific Gas and Electric Company has acquired control of the water rights of the Pit river drainage for the installation of hydroelectric plants. The prolific sources in Shasta county are combined with those in Lassen and Modoc counties in broadly bounding the area secured. Work will be started immediately on a system of units which, when completed, will deliver to the San Francisco district and intermediate territory in Northern California more than 2,000,000,000 kw-hrs. of electrical energy annually. The economic gains already won through hydroelectric achievements in California, bringing world-wide fame and prosperity to the state, will be not only maintained but tremendously increased.

**SAN FRANCISCO, CAL.**—Pending installation of meters on all flat rate services the Mt. Whitney Power and Electric Company has been authorized by the Railroad Commission to collect its basic charge for electric energy plus a surcharge of 30 per cent. This collection method is authorized because of the inability of the company to install meters prior to the commencing of service. The basic rate, plus the surcharge, will make the rate equal to the rate fixed by the Commission in its recent decision, and will be collected in this way only for such time as the services are unmetered. A decision



by the Commission on March 23rd last abolished the company's flat rates. A recent order provides for a temporary restoration of the flat rate.

**SACRAMENTO, CAL.**—The Sacramento Northern Railroad Company, headed by G. F. Detrick and organized June 20, 1918, for the purpose of reorganizing the Northern Electric Railway Company, Sacramento and Woodland Terminal Company and the Marysville and Colusa branch of the Northern Electric Railway Company, has issued its financial report for the year ended December 31, 1919. In its income statement there is included net depreciation on way and structures amounting to \$167,969, under the head "Railway Operating Expenses." The income balance, transferred to profit and loss, was reduced by current profit and loss entries, the principal item being a loss of \$30,157 on retirement of the Hamilton branch, leaving a balance of \$71,030, which was applied to amortize a like amount of the balance of \$110,640 reorganization expenses.

### THE PACIFIC SOUTHWEST

**SPRINGER, N. M.**—The Springer Ditch System Company contemplates the erection of another reservoir, to cost about \$100,000.

**LOS ANGELES, CAL.**—An ordinance has been passed granting to the Pacific Electric Railway Company a franchise to construct a single railroad spur track upon Santa Monica Boulevard.

**TUCSON, ARIZ.**—A bond election will be held May 15, 1920, for the purpose of voting on a bond issue for \$330,000 to be used for waterworks improvements, street improvements and ornamental street lighting.

**PHOENIX, ARIZ.**—An injunction has been filed by J. K. Doolittle, vice-president and general counsel for the Verde Water Power Company, asking that the Salt River Valley and Paradise Verde Water Users be enjoined from putting in a dam at Horseshoe Bend on Verde river.

**PARADISE, CAL.**—Owing to the present depressed condition of the bond market, directors of the Paradise Irrigation District have voted to reject all bids on the \$140,000 bond issue recently voted. The bonds will be readvertised for sale at a later date, and the interest will be fixed at not over 6 per cent.

**CALEXICO, CAL.**—It is reported that the Mexican Government contemplates the erection of a dam in the Colorado river, 15 feet high, in order to raise the water four feet at Hanlon heading during the low period. Yuma authority refused to allow a weir to be built by the Imperial Valley district.

**LOS ANGELES, CAL.**—A bond issue of \$5,000,000, for the construction of an irrigation system and power plant, carried at the recent election. According to word received by W. E. Tussig, of South Pasadena, 27,000 acres on the east side of Mojave river will be benefited by the new project. Water is to be taken from Little Bear Lake.

**TOMBSTONE, ARIZ.**—Governor Campbell states that unless the U. S. Government shows more interest in reclaiming the arid lands of Arizona, the state itself will take steps to build the projects. The state can only issue \$150,000 according to law, but the Governor has already under consideration plans for removing this limitation.

**LOS ANGELES, CAL.**—A contract has been let to the Palmdale Water Company for the construction of a dam in Little Rock Creek above Antelope Valley. The dam will provide water for the Palmdale and Little Rock irrigation districts. It will be 160 ft. high and of the multiple arch type. The water will be carried to Harold Lake, nine miles distant, then distributed.

**BRAWLEY, CAL.**—Engineer Sellow, formerly of the Reclamation Service and project engineer at Yuma, suggests turning the Colorado

river back into its course, building levees at the south end of Volcano Lake, and there impounding a reservoir capable of storing a million and a half acre-feet of water. He also contemplates reversing the Solfatara Canal when the water supply in the Colorado runs too short for the territory irrigated. More than 200,000 acres of additional land can be irrigated west of New River by this means. Surveys will be necessary before a site for a permanent dam can be determined.

### THE INTER-MOUNTAIN DISTRICT

**PAYSON, UTAH.**—Electric light rates in Payson have just been increased from 8c. per kilowatt-hour, the rate which has prevailed for several years, to 10c. per kilowatt-hour. Payson is served by the U. S. Government plant in Spanish Fork canyon.

**SALT LAKE CITY, UTAH.**—The Whitmore Oxygen Company, of Salt Lake City, has applied for permission to divert thirty second feet of water from Little Cottonwood Creek, to be carried by means of a flume and pipe line a distance of 6,250 feet, for the purpose of generating power at Wasatch, Utah.

**SALT LAKE CITY, UTAH.**—The Utah Power & Light Company conducted a washing machine campaign during the month of March, the results of which were remarkable. During this one month 1711 washing machines were sold in this territory, where the population served is approximately 352,000.

**BUTTE, MONT.**—With organization work completed, representatives of the Montana Irrigation Congress, Montana Irrigation and Drainage Institute and the Yellowstone Irrigation Congress have adopted in tentative form an initiative bill to create a twenty-million-dollar revolving fund for the construction of irrigation projects throughout Montana.

**SALT LAKE CITY, UTAH.**—Having been granted a franchise in the town of Millville, Utah, to supply its inhabitants with electricity for light, heat, power and other purposes, the Utah Power & Light Company has filed with the public utilities commission of Utah a petition for a permit and certificate of convenience and necessity to exercise its rights under that franchise.

**OGDEN, UTAH.**—An application has been filed with the state engineer for 200 second feet of water from Ogden river. It is proposed to conduct this water 44,000 feet through a canal and a five and one-half-foot pipe line, and then drop it under 400-ft. head to develop 5,000 hp. of electric energy for the purpose of pumping water for irrigation in various parts of Weber and Boxelder counties.

**FALLON, NEV.**—Construction of the one hundred miles of ditches to effect drainage of the Newlands Project will commence by September 1. This is according to John L. Burkholder, drainage construction engineer of the United States Reclamation Service, who has arrived in Fallon from Denver to complete preliminary arrangements. Drag-line excavators will be used in digging the drainage system, and everything will be conducted along the most economic lines. A bond issue of \$700,000 to finance the work was recently authorized by a vote of settlers.

**SALT LAKE CITY, UTAH.**—The petition of the Union Portland Cement Company of Ogden for a peremptory writ of prohibition to restrain the Utah Public Utilities Commission from considering a special contract entered into between the cement concern and the Utah Power & Light Company was denied on April 9th by the Supreme court of Utah. A similar order was issued in a like application of the Ogden Portland Cement Company against the Public Utilities Commission. These cases arose from an investigation by the Public Utilities Commission of special contracts entered into by the power company with seventy-nine corporations in the state.

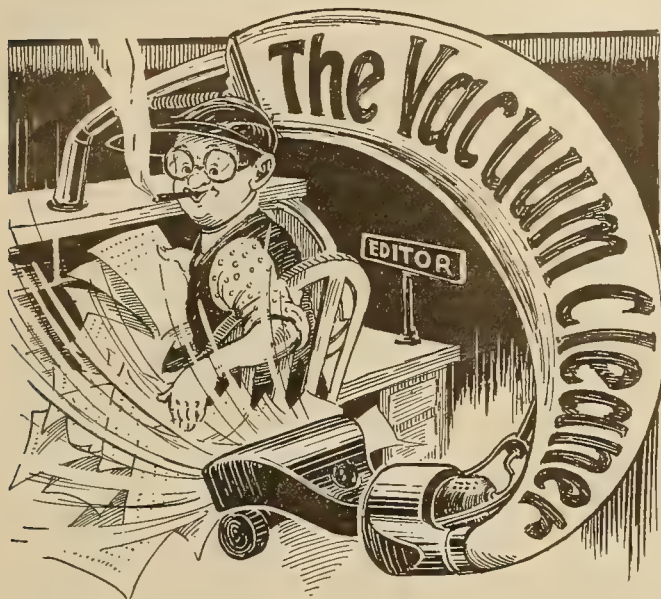
**BOISE, IDAHO.**—Although a city may have its own light plant, and so far as that plant is concerned be exempt from the regulation of the public utilities commission, when it contracts with a public utility company for service the service so contracted for is subject to regulation by the utilities commission the same as any other public utility service, it was ruled by the Public Utilities Commission of Idaho in the case of the application of the Utah Power & Light Company for permission to apply certain rates for standby service furnished the city of Idaho Falls. The city authorities protested on the ground that the commission had no authority over the contract.

**SALT LAKE CITY, UTAH.**—To promote the development of unexploited power resources in the Great Salt Lake Basin, Ralf M. Woolley, U. S. Geological Survey engineer, is compiling data on the operation of existing hydroelectric plants and favorable plant sites. This information will be published in book form by the Geological Survey office at Washington, D. C. There are approximately fifty hydroelectric plants in the basin at present, according to Mr. Woolley's statement. These generate about 160,000 horsepower. Mr. Woolley is of the opinion that there could be developed, in addition to this total, about 145,000 horsepower. An average of 15½ horsepower per square mile is generated in Utah, compared with an average of slightly more than 60 horsepower per square mile in Idaho.

**SALT LAKE CITY, UTAH.**—As a result of a movement which was inaugurated late in 1919 by the State Street Improvement Association, Salt Lake City will soon have a substantial addition to its Whiteway lighting system. The plans contemplate an immediate installation of Whiteway lighting of twelve blocks in the business district from State and Broadway, with a further additional installation at a later date. After conducting several tests as to lighting efficiency, the 6.6 ampere arc lamps were decided upon, three on each post, with seven standards per block, as now installed on Main St. The cast iron standard has been adopted, in a very attractive design. It is felt that the new lighting district will be the forerunner of still larger developments along this line, and with this addition to its present Whiteway lighting system, which is now considered one of the finest in the country, Salt Lake City will soon have a business district which, from a lighting standpoint, is unexcelled.

**BOISE, IDAHO.**—The Public Utilities Commission of Idaho has recently made a ruling whereby the patrons of public utilities who are not residents of a municipality in the state of Idaho which demands and receives any free service or receives payment in the way of an occupation tax, shall be relieved of the burden of paying or contributing indirectly to such municipality; and all public utilities over which the commission has jurisdiction, are ordered to file with the commission a statement showing the name of each municipal corporation receiving such tax or free service, the amount of money paid, the value of any free service rendered, the value of any service rendered which is not charged for at regular rates, and the difference between the charge made and that provided by the regular rate; also the cost of installation, maintenance and operation of any excess or duplicate installation or equipment. The public utilities must also submit a proposed change of rate or rates applicable only to their patrons within the limits of the municipality requiring such payment as shall result in an increased income sufficient in the aggregate to offset the money payment, or service furnished or increased cost of operation demanded by such municipality, which shall be proportioned among all the patrons of the utility within the limits of such municipality as equitably as may be, and shall be provided to be collected in the most inexpensive and practicable method.





### "IN THE SPRING—"

When the order clerks are stupid  
And the office boy is green;  
When the rings and cleeks in business  
Are the worst you've ever seen;  
When you're tired of all the city clubs,  
And bored with tees and balls;  
When you think you'll pawn your cuff links  
Till the cost of living falls;

Then it's time to plan Del Monte  
Where the Jobbers all convene,  
And use the iron in your soul  
To putt upon the green;  
And when you're in the swing of it,  
You'll tell the H. C. L.  
That stymied you a while ago  
To take itself to—oh, anywhere.

D. E. E.

\* \* \*

We are always saying that there is nothing electricity can't do, and information which has recently reached us assures us that people will soon be keeping batteries in their cellars and snapping their fingers at the eighteenth amendment. A San Francisco physician has succeeded in dividing electric vibrations in such a manner as to produce the effect of alcohol upon the human body. He recently demonstrated to a few select friends the mechanism which produces the alcoholic waves, and we have it on good authority that the aforesaid friends staggered from his office in various stages of blissful intoxication.

Another argument for the electrical home.

\* \* \*

A safety provision that seems to have been overlooked by most railway companies is brought out in the story of the president of a small line who once waited on a railroad magnate to request an exchange of courtesies.

"On our line, sir," said he proudly, "not only has a collision never occurred, but on our line a collision would be impossible." "Impossible?" said the other, "oh, come; I know that the latest automatic safety devices are excellent things, but impossible is a large word." "It's literally true with us, sir," was the reply. "How can it be?" asked the magnate. "Why," said he, "we own only one train."

There may be safety in numbers, but they should be small numbers.

Names such as Smith and Brown have their compensations. Few things are more pathetic, for instance, than an eleven-syllabled customer helping the store clerk make out the charge check. In the case of the telephone, your name may lead to the severing of diplomatic relations, as in the following friendly dialogue:

"Are you there?"

"Yes!"

"What's your name?"

"Watt's my name."

"Yes, what's your name?"

"I say my name is Watt. You're Jones?"

"No: I'm Knott!"

"Will you tell me your name?"

"Will Knott."

"Why won't you?"

"I say my name is William Knott."

"Oh, I beg your pardon!"

"Will you be in this afternoon if I come around?"

"Certainly, Knott."

After which they rang off.

Another case on record is of two doctors, name Paradise and Hellser, who shared an office. The telephone rang and a voice asked:

"Is this Paradise?"

"No, this is Hellser."

"Oh—the devil!"

\* \* \*

When we were young we used to sing an ancient ditty running as follows:

"The famous Duke of York  
He had ten thousand men.  
He marched them up to the top of a hill  
And he marched them down again.

And when they were up they were up,  
And when they were down they were down,  
And when they were only half-way up  
They were neither up nor down."

We have never heard the second stanza questioned, but in a local newspaper we find an item which opens thus:

"The King of France marched ten thousand men up and down a hill because he wanted a place in history."

Either we have been misled from our early youth, or else this particular form of military activity was a singularly popular pastime in former days.

\* \* \*

If you fall overboard, make a point of doing it in the presence of a fluent talker. The following story will explain a piece of advice that may seem somewhat obscure:

Among the passengers on a ship was a man who stuttered badly. One day he hurried up to the captain and started: "Th-th-the—"

"I'm very busy, now," interrupted the captain. "Tell the mate here."

But the mate was also busy, and the stutterer tried everyone else in sight without success. Finally he came back to the captain.

"Look here, man, sing it! That's the only way," urged the officer.

Whereat the man chanted in a tragic voice:

"Should auld acquaintance be forgot and never brought to mind? The blooming cook fell overboard and is twenty miles behind."

\* \* \*

Colored patient in hospital: "Boss, how do you-all do youah cookin' in thah?"

Orderly: "Well, Sam, you know we have the latest fandangled methods over here; in fact, we do our cooking by electricity."

Colored patient in hospital: "Well, boss, you sho' ought to have given dem beans another shock."



# JOURNAL OF ELECTRICITY

VOL. 44 NO. 10

SAN FRANCISCO, MAY 15, 1920

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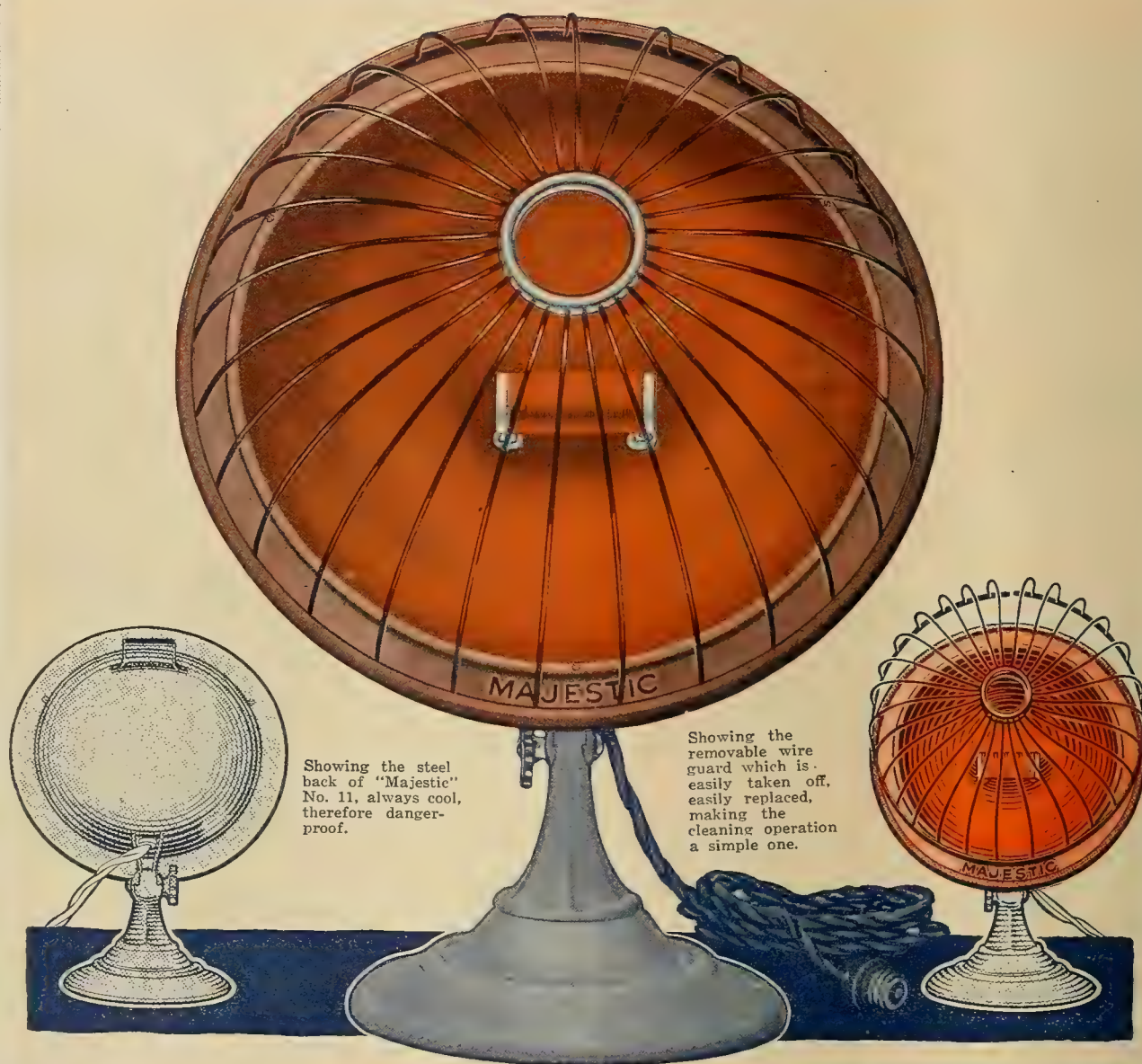


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# JOURNAL OF ELECTRICITY

FOUNDED 1887

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VOLUME 44

SAN FRANCISCO, MAY 15, 1920

NUMBER 10

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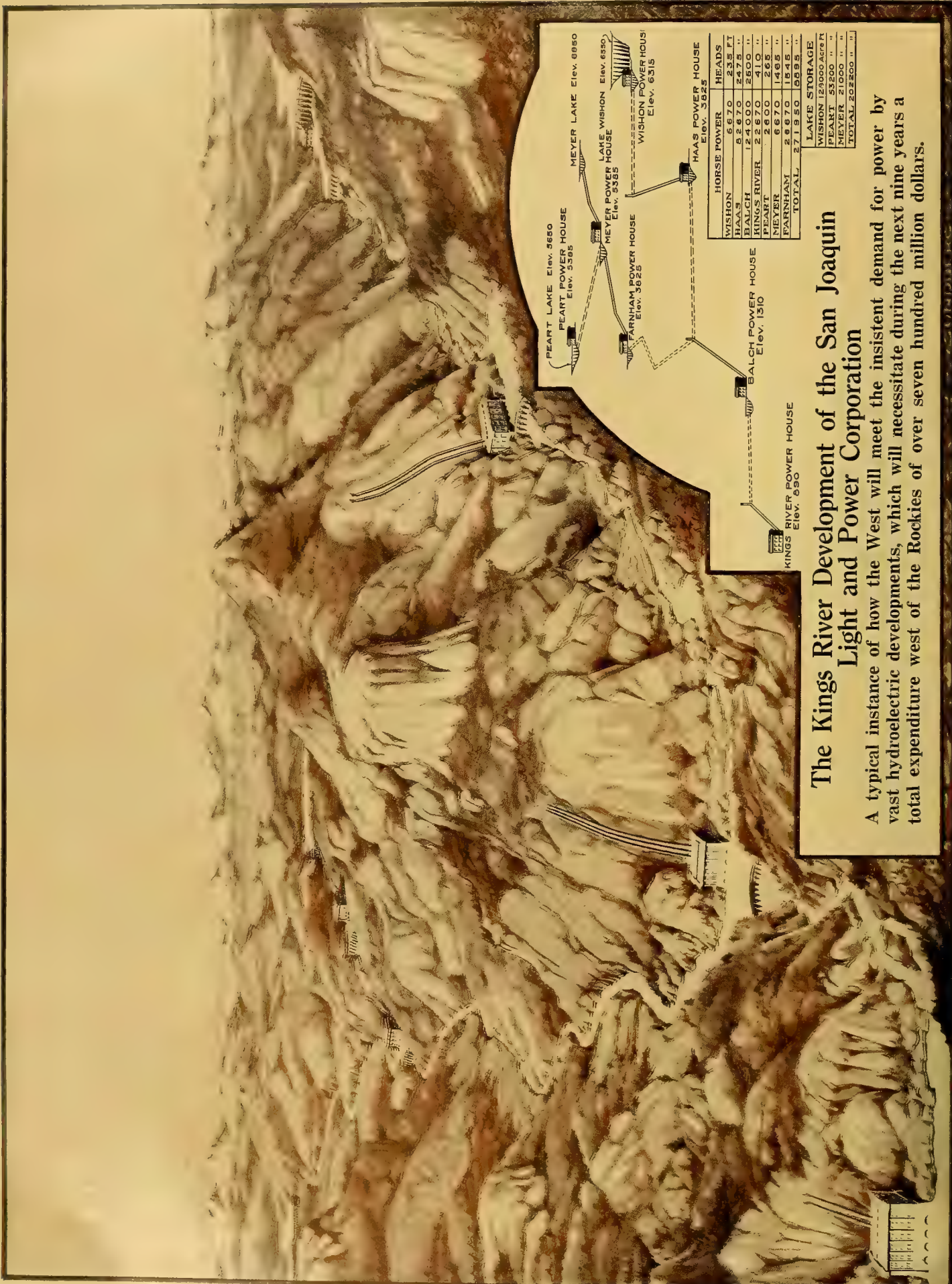
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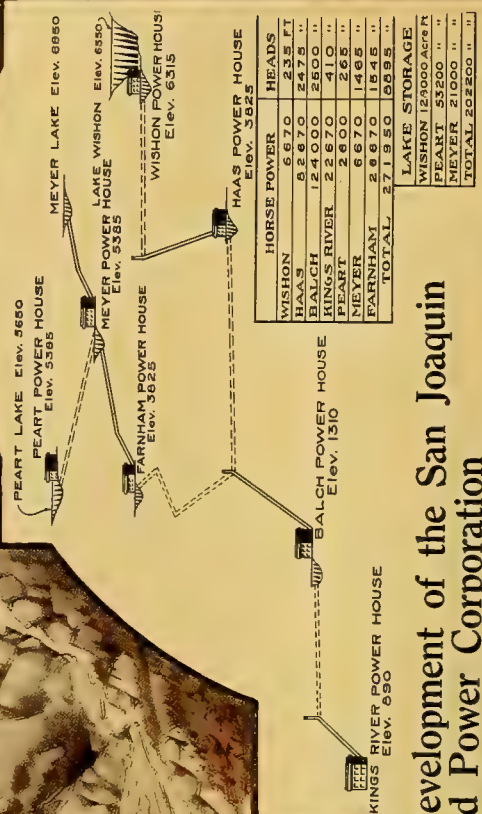
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## The Kings River Development of the San Joaquin Light and Power Corporation

A typical instance of how the West will meet the insistent demand for power by vast hydroelectric developments, which will necessitate during the next nine years a total expenditure west of the Rockies of over seven hundred million dollars.







# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, MAY 15, 1920

Number 10

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## What the N. E. L. A. Convention in the West Means to the Nation

**I**T is difficult fully to appraise the far-reaching effects of the National Electric Light Association Convention that is this year held in Pasadena, California. Many eventful years have in times past registered achievements of this organization that have meant much to the nation at large, and yet of all these years this year in particular is of unusual significance to men of the industry, and to the public at large. The shortage of power and the possibility of draining too heavily our natural resources in coal, fuel oil and natural gas, bring to light more forcefully than ever the necessity for new and vast creation in power development. From Pasadena, the West is enabled to make heard a voice that among the crowded throngs of Eastern thoroughfares in former years stood little chance of an appreciative audience. Visualizing the fact that 70% of the nation's water powers lie in her domain, and that her interconnected systems stretch over distances equal to that from New York to Omaha or from New York to Jacksonville, Florida, men of the East can gain some fair conception of the vastness of vision that prevails here in the West. And so it is that when we view the electrification of a transcontinental railroad, the uses of electricity in pumping for irrigation, the development of mines, the application of electricity to every conceivable use upon the farm and in the home, and finally the high state of development of the average citizen in uses of electricity in the West, we may indeed say that the great convention in Pasadena this year promises unusual good things for the industry throughout the nation.

We of the West welcome men of our industry from all quarters of the nation. We trust that the buoyancy, enthusiasm and newness of life which prevail in a breadth of vision as vast and unlimited as is our district west of the Rockies, may have for each and every one of you a message of cheer, and an inspiration for future attainment that may carry our industry to even higher planes of accomplishment for the welfare and happiness of the human race.

The most powerful report ever compiled on the water power situation in America is that of the current committee's report on this subject for the National Electric Light Association convening at Pasadena, California. This report is published elsewhere in the Journal of Electricity in full. The report speaks volumes for the electrical industry. It has been compiled in a non-technical manner, setting forth valuable data on the present status of water power legislation, present tendencies in hydroelectric transmission and high voltage design, and winds up with a recommendation as to how the vast sums of money necessary for the industry may in the future be acquired. Forceful emphasis is given to this latter feature. From the statistics presented in the report one finds that something over seven hundred million dollars is required for investment in hydroelectric securities west of the Rocky Mountains during the next nine-year period.

Featuring in a pictorial way the status of present day developments in hydroelectric transmission, the committee has compiled an exhaustive map of the vast transmission systems located west of the

Rocky Mountains. The cooperation of some fifty-eight companies has made possible this work. It represents a masterpiece in painstaking compilation and is a chart that will unquestionably prove invaluable to the industry as the best one to date setting forth interconnections of service and the possibility of long distance transmission of electrical energy. We commend the committee most heartily for this effective and splendid work that has thus been done. While the Journal of Electricity undertook the task of gathering this data for the map, it could never have been accomplished without the close and helpful cooperation of the water power committee and of the fifty-eight power companies west of the Rocky Mountains.

Much has, in former months, been said in a national way concerning the rapid rise of the Contractor-Dealer movement in the far West. For many years those who have been in close touch with the situation of electrical merchandising on the Pacific Coast have known that the ethics upheld and the method of organiza-



tion in vogue here in the West are of high quality. It is interesting to see how this movement continually advances. In 1912 the first real constructive seeds for future cooperative efforts were sown by the formation of Development Leagues and the like in the West. Then followed the Contractor-Dealer movement in city and state organizations, and as a final climax, the launching of what is today known nationally as the California Electrical Cooperative idea. Not only have stores been improved, new locations sought and the financial status of the Contractor-Dealer been very notably advanced, but the industry as a whole has prospered by closer and more coordinated efforts. And finally, service to the public has been bettered.

Then, too, the public is rapidly being brought to a clearer realization of the problems of the industry today through the vast advertising schedule that is now under way in the daily press throughout California. At the recent meeting in Stockton, California, of the California Association of Electrical Contractors and Dealers, a new advance was made in that hardware stores and department stores were brought into the conference. The straightforward and manly manner in which points at issue were argued, and the helpful attitude that prevailed throughout this meeting, show clearly the high status which the Contractor-Dealer movement in California has attained.

The Journal of Electricity, as a consequence, would feel it had not done its complete duty in chronicling the achievements of the past year unless at this time, when men of the industry are gathered in conventions in the West from all districts of the nation, it commended in highest terms the effective work of the Contractor-Dealer movement.

Many splendid new ideas have been brought into the National Electric Light Association's life during the current year, but none perhaps with such far-reaching possibilities as the reorganization work proposed in regard to the status of members and the status of various branches of the electrical industry in their relation to the National Electric Light Association. We commend most heartily the idea of giving broader representation to the manufacturers and jobbers, and would recommend that this representation be extended to electrical contractors and dealers. Perhaps the basis existing in the Pacific Coast Section N. E. L. A. may well be followed in the national organization. Here all branches of the industry sit upon the executive committee and the work has been found unusually harmonious, helpful and of a high educative value, both to the industry and to the public at large. The lessening of the dues for certain classes of membership and the raising of others, making it easier for the employees of the various branches of the industry to become affiliated with the National Electric Light Association, is to be commended. As the years roll by, it is demonstrated more and more clearly that one section of the industry finds it difficult to stand alone in the work that

is to be performed. Consequently, the growing tendency to give broader and broader representation in the National Electric Light Association to other branches of the industry, outside of the central station group, is greatly to be commended. Unquestionably, as time goes on, these limitations will be still further removed until finally there will be one solidified cooperative industry throughout the nation, working through one well organized body, such as the National Electric Light Association, equally representative of all branches of the industry, and powerful in developing the industry within itself, and in forwarding service to the public which, after all, must always be the final aim of such an organization, if its work is to prove of permanent value.

All of the major associations and minor societies have codes of ethics for the guidance of their members. In some cases these codes

**Code of Ethics** have no real practical meaning because their provisions are not rigidly enforced, or because there

is no machinery provided for their enforcement. It is a pleasure to note that the American Society of Mechanical Engineers proposes to have both a comprehensive code of ethics and means of enforcing it. The other engineering societies might do well to follow the lead of the Mechanical Engineers. In other branches of the engineering profession, particularly in the electrical branch, there is as great need for a rigidly enforced code of ethics as in any other. There are not so many occasions afforded in the electrical field as in the mechanical field where the provisions of the code of ethics might come into play, yet the dignity of the profession would be measurably stabilized were it public knowledge that the practices of all the engineers in the society were governed alike, and that only engineers of the very highest ideals could retain their membership in the association. Such a condition would tend to retain within the province of the societies the functions which the various states' engineer licensing laws would transfer to the state government.

The study of crystals has made possible new and interesting discoveries in scientific and engineering matters during recent months.

**The Revolving Electron Group** The paper by Professor Harris J. Ryan, given before a recent meeting of the American Institute of

Electrical Engineers, brought out in a most interesting and conclusive manner how the submarine problem was virtually solved by studying the phenomena attendant upon crystal vibrations. Thus a crystal vibrating with enormous oscillatory motion was shown by him to produce sound waves that are far above the sensitiveness of the ear, and, as a consequence, are known as super-sonic vibrations. By means of such vibrations sound waves were produced, although inaudible to the ear, in such a way that echoes from submerged bodies, such as submarines, could be distinctly registered in the office of the observer, and so delicately that the location



of the submarine could thereby be ascertained. On another page of this issue is to be found the eleventh article on electrons and a new theory of matter. In the issue of the Journal of Electricity for April 15, 1920, was set forth an interesting study by Dr. A. C. Crehore, in his now widely read series of articles on "The New Physics." In this particular article Dr. Crehore discussed the average force between revolving electrons. By taking as a specific example the attraction between crystals, he develops a very interesting relationship in which he establishes the fact that the average force between two revolving electrons may be computed when the directions of the axes are fixed and specified as they are in a crystal. This enables us to picturize in a measure his new theory on the constitution of matter. Thus he shows, from the illustration of crystals discussed, that this particular class satisfies the condition that the weight of the crystal is independent of the orientation of the axes of the crystal, and thus makes possible a visualization of the action of the electron, which should give new and clearer meaning to this discussion of the constitution of matter and the New Physics which he has set forth in such an interesting and helpful manner.

Too long has our industry awaited the standardization of accounting systems. Great progress has been made along this line in the merchandising of electrical ware, but in a comparative study of privately owned and municipally owned power plants little data is available that may be relied upon as representing equality in comparison, either in justice to the privately owned plant or to the municipally owned plant. Many states of the Union have recognized the desirability of having unified accounting systems under direction of the regulatory bodies of those states both for privately owned and municipally owned power plants. Yet it is true that some of our most progressive and down-to-the-minute commonwealths have failed utterly in this regard. California, Michigan, Illinois, Vermont and Maine are glaring instances of this. In view of this crying need of the hour, the Journal of Electricity has conducted a nation-wide research to find out the exact status of this important question of unification of accounting systems for privately owned as well as municipally owned utilities. The results of this questionnaire that have come in from regulatory bodies in all the states, as set forth on another page of this issue, are highly illuminating. Practically unanimously, commissions the country over favor unification of this sort. An immediate campaign should be started to bring about an enabling act in all commonwealths not having unification standards at the present time, in order that open and above board comparisons—comparisons free from camouflage—may be made in the study of relative merits of privately owned as opposed to municipally owned utilities, and also that the splendid economic data available in various utilities, both municipally owned and privately owned, may have a common

basis in comparison, and thus advance the industry as a whole in its economic supply of power to the public at large.

The increasing possibilities of Mexican petroleum being used in various steam-electric power plants throughout the West, brings up the discussion of the sulphur component in this particular oil. While sulphur has in itself a heat-giving component amounting to about 4,000 B.t.u. per pound, this extra heat value is not generally considered in itself of sufficient consequence to give sulphur importance as a fuel, in oil in which it may appear to an excessive amount. Sulphur, in burning, forms sulphur dioxide, which on combining with water forms sulphurous acid. Ordinarily corrosion does not occur as long as the temperature is above 212° Fahrenheit; hence corrosion of the boiler tubes is negligible as long as the boiler is kept in operation; but if a boiler is used for standby purposes, as many of our Western steam-electric power plants are, and is kept shut down a good deal of the time, there may be active corrosion of the tubes and drum shells.

Steel stacks are subject also to corrosion from this cause, especially the upper portion exposed to the weather where the cooling effect of the metal causes condensation of the moisture in the gases. Since these conditions are liable to arise in a more exaggerated degree than hitherto encountered, as a possibility of use of Mexican petroleum in Western power plants becomes more and more a reality, the subject of sulphur and its possible deleterious effects upon the steam generating equipment such as boiler tubes, drums and chimney stacks should be given more attention.

The thrilling days of war brought out more than ever before the necessity of improved economies in steam power plants. The good results to be obtained by careful and accurate metering in the power plant, combined with the constant study and skill of the trained engineer in combustion and steam engineering, brought forcefully to light the value of these as effective means for increasing economy. Through all this, however, there has been growing in recent months the insistent demand that power plants operated by fuel oil be, insofar as possible, automatically controlled. No other type of fuel, unless it be that of natural gas, lends itself so readily to delicate automatic control as does the power-plant burning fuel oil. The interesting and highly educative accomplishments of the new Cornelia Power Plant at Ajo, Arizona, recorded on another page of this issue, are illustrative of the delicate control that may be accomplished in fuel oil burning plants. In this plant it is seen that from three to four per cent is gained in efficiency by the use of automatically controlled fuel oil burners. The careful operation of this plant under Mr. Rogers, chief engineer, who writes the article above men-

### Unification of Accounting Systems

### Automatic Regulation of Fuel Oil Plants



tioned, shows the value of a trained hand in modern economic practice. Power plant operators throughout the West, and elsewhere in installations using oil as a fuel, will do well to study this question of automatic control and thus make possible the bringing about of economies thought otherwise unobtainable.

Practically all our large steam electric power plants are located along the waterfront, or adjacent to large bodies of water. For many years past the teredo has been a common pest to the shipping industry in the wharves and waterfronts of the large seaports of the Pacific Coast, but, so far as the steam-electric industry is concerned, has been of little moment in the consideration of steam power plant development. The present drought, however, which has been of three years' duration in the West, has brought to light a new phase of the situation that may lead to interesting developments in the steam-electric industry, which in turn may help in the solution of the teredo problem.

The teredo, a very small organism that initiates its destructive work in piers and piles lining salt waterfronts, cannot exist in fresh water. After it has once become imbedded in a pile, it increases very rapidly in size, and in a short time by boring further into the pile it may become from 12 to 16 inches in length. The low water supply in such rivers as the San Joaquin and the Sacramento has brought salt water much farther upstream during the past two or three years than formerly, and as a consequence in places where the teredo used not to exist he today is most active. Along the waterfronts of these rivers vast destruction has been going on, and in a number of power plant foundations and boiler house installations the teredo has appeared to a very disastrous extent. It has developed that creosoted piles are not affected by the teredos, but if an uncreosoted stick of wood be nailed to a creosoted pile and the teredo once gets started in the uncreosoted piece, he will eat through to the creosoted portion of the adjacent pile and thus accomplish his destructive work.

There are many other interesting sidelights of this situation that may now be studied, and it is hoped that all possible consideration will be given to this destructive pest of the salt waterfronts. Since the foundation work and supports of circulating water supplies and other installations connected with the modern steam-electric power plants are at stake, the power industry may well give considerable attention to this problem.

At a recent meeting of the civil engineers in San Francisco, at which over 125 members were present, the subject of the teredo came up for most earnest and thoughtful consideration. Here, then, is an opportunity for the mechanical and electrical engineer to help out in the solution of this dangerous situation that confronts foundation work, either in salt water or in fresh water where salt water at some period may become available.

The confusion which has resulted from the diversity of theories of valuation held by our courts and engineers is now being acutely felt in the insufficient rates and fares which are demanding revision in all branches of industry and in all parts of the country. Where proper allowance for replacement has not been made—and unfortunately precedent has too often led both courts and engineers to accept an insufficient rate base upon which returns are allowed—the public now finds itself in the position of having accepted service for years below cost and of having to face the situation of either allowing a return sufficient to make up for the losses of this period or of providing substitutes for businesses which can no longer carry on in the face of increased costs and wage scales. The condition of electric railways is fully as serious as this would indicate, and may be looked upon by the somewhat more fortunate branch of electric service corporations as an example of where such a policy of malnutrition may lead.

The engineer is the authority to whom we should look for the stand which shall clarify the situation. In spite of the confusion of thought which has complicated the situation, the principles which underly this problem of valuation and the determination of the rate base are exact, and capable of logical determination. The matter has been brought up by J. R. Bibbins for consideration at the A. S. M. E. convention at St. Louis, and should bring forth discussion and subsequent society action which should do much to clear up the deplorable lack of unanimity among engineers. It is to be hoped that the stand taken at this time will be sufficiently far-sighted and scientific in its principles as to avoid the pitfalls of arbitrary allowances to cover deficiencies which should not exist and which are susceptible of varying interpretations in the name of justice. In any case, a united stand on any ground will soon win over the recognition of the courts which are themselves dissatisfied with the present state of chaos.

## JUNE 1st—CONVENTION ECHO NUMBER

Reports of sessions, high lights of the business and entertainment features—a complete and indispensable review of the three big conventions of the year:

Electrical Supply Jobbers' Association.....	Del Monte, May 12-14
Pacific Coast Section, National Electric Light Association.....	Pasadena, May 17
National Electric Light Association.....	Pasadena, May 18-22





#### WHERE SEVENTY PER CENT OF THE NATION'S WATER POWER WAITS DEVELOPMENT

To the mountainous topography of the far West is due the fact that two thirds of the nation's water power is located in this region, 70% of the undeveloped water power being found west of the Rocky Mountains. The scene shown is that of the headwaters of the Skagit River, on which Seattle is developing additional power.

## Developing National Water Power

(The following report by the Water Power Development Committee of the National Electric Light Association is undoubtedly the most comprehensive discussion and compilation of such data ever attempted by the electrical interests of the country. The figures used in the tables and curves are the best obtainable from the most reliable sources, practically all the leading engineers and executives of the West and many of those of the eastern power companies having been consulted.—The Editor.)

In the preparation of this report and in the collection and compilation of the data contained herein, the Committee wishes to acknowledge and express its appreciation of the assistance given by prominent Central Station officials throughout the country and others closely affiliated with the industry.

Particular credit is to be accorded Mr. Robert Sibley, editor of the Journal of Electricity and Pacific Coast editor Electrical World, and to members of his staff, for their hearty cooperation in the preparation of this report, the map and the compilation of the western data here presented.

#### Growing Importance of Water Power Development.

The imperative demand of a water power development schedule embracing in large measure the great unused natural resources of the country is no longer doubted. Heretofore there has perhaps been no better constructive work done in behalf of water power legislation and development than has year after year been accomplished by investigations, compilations and discussions in meetings of the National Electric Light Association. The technical press of the country, the engineering and scientific societies, and the formal reports of this organization have fairly well covered the national aspect of the question of water power development. We shall, as a consequence, not endeavor to touch upon the broad general fields of investigation undertaken by previous committees, but we shall take advantage of the peculiar setting of the National Electric Light Association Convention this year at Pasadena, California, to give prominence to the conditions of water power development prevailing west of the Rocky Mountains, which we believe to be of such importance as to call forth the interest and earnest consideration of this body. But while these discussions are in a certain sense local, let it be understood that they are cited for the purpose of giving instances near at hand for verifica-

tion rather than to set up for emphasis the individuality and peculiarities of water power problems in the far west.

#### Need of Fuel Conservation in West

Taking then the instance of the eleven far western states, as a specific example, we find by careful survey an unusual situation. Due to delay of the construction program in power development, for some two or three years while the nation was in the throes of war, this section of the country finds itself today facing a serious situation, ranging from an actual shortage of power to meet present demands, as in California, to an impending shortage to meet growing demands, as in Oregon and Washington. With increasing possibilities of coal shortage, the continual rise in price of oil, and the economic desirability of early electrification of steam railroads, the urge for increased water power development in the far west becomes imperative. Not only are many industries already existent dependent upon electrical development, but it is believed that industrial growth on the Pacific Coast and electrical development are interdependent.

And if this is true in industry, surely it has proven true in agriculture. Vast areas of arid and semi-arid western lands that may be termed empires, have been converted into fertile districts under electrical pumping of water that would be impossibilities without its use.

#### Water Power in Eastern States

To a lesser degree the further development of the water power in the eastern states calls for the serious and earnest attention of not only the public utility operators and users of large blocks of power but also that of the conservationists and the government itself.

While the potential water powers of the eastern and central states, as a whole, can never be expected to meet more than a minor part of the present total power requirements of those states, which is approximately 96,000,000-hp., as against





#### STORAGE POSSIBILITIES IN IDAHO

Controlling works in the north channel of the Spokane River at Post Falls, Idaho, where flood waters are impounded during the winter season, thus permitting a greater power development on the river below. It is probable that the use of storage would increase the available horsepower for the United States from about 60,000,000 to 200,000,000.

approximately 18,000,000-hp. of maximum potential water power possible of development in those states, the trend of labor and transportation conditions makes imperative the utmost co-ordinated development and application of hydroelectric power wherever available.

Much might also be said of this need in the eastern states purely from the standpoint of conservation of coal. Of the 542,000,000 tons of coal used in this country in 1915, approximately 267,000,000 tons were used for power purposes and 275,000,000 tons for heating. The efficiency at present obtainable for the latter use is approximately 50%, whereas for the former it approximates but 5%. It is therefore obvious that in so far as possible the remaining coal supply of this country should be relieved of its power application and conserved for its more efficient heating application.

Altho most desirable for the protection of future generations, it is of course not to be expected that water powers will be developed, at least in the near future, under conditions and in locations where an abundance of cheap coal or other fuel results in an economic advantage in favor of steam generation, but the time will no doubt come when the utmost development of all water powers will be enforced, if necessary, in the interests of conservation of fuel for heating purposes.

There are, however, at the present time numerous undeveloped water powers in the eastern states which can successfully compete with coal generation, and these undeveloped water powers are only awaiting favorable legislation to pave the way for their development.

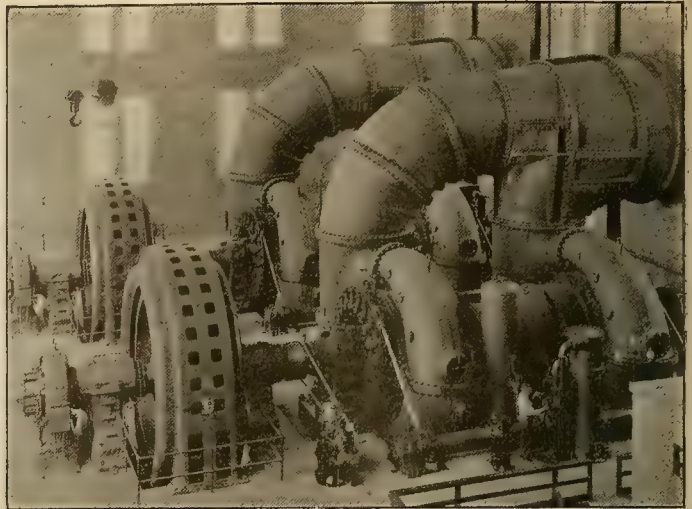
#### Necessity for Legislation

Present economic conditions affecting such developments in various of the eastern states are reflected in the replies received from prominent eastern central station men in answer to inquiries along this line. These replies are presented in full in Appendix "A" attached to this report. They are from representative men in the electrical industry and throw considerable light on the trend of opinion of those who are facing the present condition of power development.

As will be noted the general trend of these replies is lack of suitable legislation and the establishment of a fixed policy on the part of the Federal Government in the granting of permits for the development of water power on federal reserve lands and on navigable streams. Some very interesting comments on other parts of the problem are also given.

#### Federal Legislation and the West

Existing federal legislation as distinguished from state legislation in so far as it directly affects water power develop-



#### LARGE UNITS CHARACTERISTIC OF THE WEST

Two of the four 14,000-kw. generators of the Long Lake Station of the Washington Water Power Company, direct-connected to 22,500-hp. hydraulic turbines operating under 168-ft. effective head. In spite of the large hydroelectric developments of the state, the water power possibilities of Washington have hardly been scratched.

ment, relates to the use by power companies of navigable waters and of public lands and reservations. Federal enactments concerning navigable waters are of general application throughout the United States, and do not affect or interest one section of the country more than any other. Federal legislation governing the use of public lands and reservations, however, is of primary importance to the western states in which lie nearly all the public lands and in which approximately 70% of the undeveloped water power of the nation is found.

#### Priority of Navigation Rights

From the date of the Act of May 18, 1796, declaring that "All navigable rivers, within the territory occupied by the public lands, shall remain and be deemed public highways," down to the present time, Congress has zealously guarded the rights of navigation and from the Congressional Acts and the court decisions construing the same we must conclude that the right of the public to use the waters of navigable streams for navigation is considered paramount and superior to all other rights to use such waters; and where such other uses tend to injure or destroy the navigation of bodies of water naturally navigable, such uses must give way to the rights of navigation. To this superior right developments of power on navigable streams must yield.

By virtue of the Act of March 3, 1899 (9 Fed. Stat. Ann. p. 81) and the Act of June 23, 1910 (9 Fed. Stat. Ann. p. 95), no dam in navigable waters may lawfully be constructed until there has been obtained the consent of Congress and the approval of the plans therefor by the Secretary of War and the Chief of Engineers, except that dams in waters, the navigable portions of which lie wholly within the limits of a single state, are permitted if authorized by state legislation and the location and plans are approved by the Chief of Engineers and the Secretary of War. The necessity of obtaining the consent of Congress in the one case and of a state legislature (if legislative authority of general character does not already exist) in the other, constitutes an obstacle which, if not insurmountable, at least operates to retard developments on navigable streams.

The Act to create a Federal Power Commission, now under consideration in Congress, would remove this obstacle by vesting in the Commission the power to issue licenses for the construction of dams in navigable waters, the plans of the dam or other structure to be approved by the Chief of Engineers and the Secretary of War if the navigable capacity of the stream is affected by the project.



The existing Act to regulate the construction of dams authorized the Chief of Engineers and the Secretary of War to impose conditions and stipulations deemed necessary by them to protect the government's interests, which may include the requirements of constructing locks, etc., without expense to the United States; of conveying to the United States free title to land needed for locks or other navigation structures when Congress authorizes the construction of the same in connection with the dam, and of granting to the United States free power for building and operating such structures. The Chief of Engineers and the Secretary of War are required, as part of such conditions and stipulations, to provide for improving and developing navigation, to fix such charges as may be sufficient to restore conditions with respect to navigability, or reimburse the United States for doing the same, and for further expense incurred by the United States, including cost of investigations necessary for approval of plans and of supervision of construction; to fix and collect just charges for the privilege granted to all dams constructed under the Act which shall receive any direct benefit from (a) the construction, operation and maintenance by the United States of storage reservoirs at the head waters of any navigable streams or (b) from the acquisition, holding and maintenance of any forested watershed or lands located by the United States at the head waters of any navigable stream, wherever such shall be, for the development, improvement, or preservation of navigation in such streams in which such dams may be constructed.

The existing Act also provides for forfeiture for non-compliance, after reasonable notice, with the Act, stipulations, or conditions; also for revocation by Congress when necessary for public use, with payment of the reasonable value of the dam and works to be determined by agreement or by condemnation proceedings on failure to agree upon the value. The term of the permit is limited to fifty years.

The existing federal legislation as to power structures in navigable streams has not been subjected to the severe criticism directed against the government's policy in regard to developments on the public domain. But two answers to the questionnaire sent out suggested that federal control or regulation of navigable streams constituted an influence retarding the development of water powers. (Minnesota and New York.)

#### Power Development on Public Lands

Existing Federal laws relating to power developments on public lands and reservations have unquestionably operated to hamper and restrict, if not almost wholly prevent, such enterprises. The creation of forest reserves and the executive withdrawal of power sites would not have deterred such projects if Congress had pursued a fair and liberal policy in recognition of the economic benefits resulting from such developments. The Acts of Congress, however, provided no definite term of use, were meager in detail, and left too much to departmental regulations with the result that financial support of meritorious projects could not be secured. The lack of certainty of tenure, the imposition of excessive rental charges, the regulation of rates for service, the possibility of cancellation of the permits, the cumbersome procedure, the lack of authority of local officials, unreasonable delays in obtaining rulings and action, absence of centralization of authority—it being necessary in some instances to deal with both the Interior Department and the Department of Agriculture—and the injustice of the regulations when but a minor part of the project was on public lands, all tended to make a development on the public domain unattractive to both investors and operators, especially if at all in actual or potential competition with other power companies owning their plants in fee simple.

A policy no doubt intended to work for conservation actually resulted in waste and irretrievable loss to the extent of the consumption of coal and oil which might have been avoided by the use of water. Ideas concerning conservation are not now so hysterical and there appears to be a better understanding of the needs of power companies and the conditions under which developments may be made on public lands, and a clearer recognition of the economic necessity of making such developments and the economic good resulting to the general public from them, with the prospect of soon receiving from Congress legislation which will be more liberal. The fear of many well-meaning persons that water powers on the public domain would be developed by grasping capitalists for the purpose of exploiting a defenseless public, is now almost entirely dispelled by the general appreciation of the power of public service commissions to regulate rates justly as between the producer and the consumer.

One of the big water power developments of the West where 350,000 hp. are to be developed, has been begun by the Pacific Gas & Electric Co. on the Pit River, California. A feature of this project is to be a 220,000-volt transmission line into San Francisco.





### State Laws of Navigable Streams

State laws relating to the construction of dams in navigable waters controlled by the state and to the use or acquisition of lands needed for the construction of power plants and of transmission lines seem to be generally satisfactory. In Pennsylvania, however, power companies are embarrassed by



ONE OF THE MONTANA DEVELOPMENTS

The Bonner Hydroelectric Plant of the Missoula Light & Water Company of Missoula, Montana. Montana has developed but 9.4% of its available water powers.

not having the power to appropriate property (eminent domain) necessary for transmission and distribution lines; and in New York, where the economical development of power possibilities cannot be carried out without regulation of flow by reservoirs; it appears that under the present constitution of that state such lands cannot be acquired by condemnation. In New York also the larger portion of undeveloped power is in, or connected with, state forest reserves which cannot be entered for practical purposes without a change in the state constitution.

### Diversity of State Legislation

The right to use, or appropriate, the waters of any stream, whether navigable or not, depends upon the law of the state wherein the stream is located. Congress has never assumed to regulate the use of water except as navigation is affected, providing in the Right-of-Way Acts that waters shall remain governed by state law. In the Forest Service Act of June 4, 1897 (9 Fed. Stat. Ann. p. 589) it is declared that "all waters on such reservations may be used for domestic, mining, milling or irrigation purposes, under the laws of the states wherein such forest reservations are situated, or under the laws of the United States and the rules and regulations established thereunder." The Forest Service has not attempted to avail itself of this last clause, but takes the position, as yet, that the states shall control the waters. Control of access to streams, however, would seem in fact to be control of the waters of the stream.

We find that in the exercise of the power of each state, by constitutional provision, by legislative enactment, or by court decision, to adopt such a rule governing the waters flowing or standing therein as it sees fit, the various states as to their water laws may be grouped as follows:

1. Those which have adopted the common law of riparian rights only, as has been done in the eastern states.
2. Those which have rejected the common law of riparian rights and adopted the Arid Region Doctrine of appropriation. This is known as the Colorado Doctrine and is in force in Alaska, Arizona, Colorado, Idaho, New Mexico, Nevada, Utah and Wyoming, and partially in Nebraska, Oregon, Texas and Washington.
3. Those which have retained the common law of riparian rights and at the same time adopted the Arid Region Doctrine of appropriation, thus having a dual system. This is known as the California Doctrine, and is in force in California, Kansas, Montana, North Dakota, Oklahoma, South Dakota, and partially in Nebraska, Oregon, Texas and Washington.

### State Water Codes

A number of states have adopted extensive water codes based on the law of appropriation but recognizing vested rights, whether riparian or otherwise. These states number Colorado, California, Idaho, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Wyoming and Washington.

These states have constitutional or legislative declarations that unappropriated waters are "The property of the state" or "the property of the public", terms held synonymous, in the making of which the state acts in its sovereign capacity only and not as proprietor or owner of the water. Such dedication is, of course, subject to the rights of the United States (1) as owner of public lands or reservations bordering on streams to the continued flow of their waters so far at least as may be necessary for the beneficial uses of the Government property and (2) to secure unimpaired the navigability of all navigable streams.

The water codes referred to contain administrative provisions too detailed to enumerate.

### Influences Retarding Development

The questionnaire answers show, in the main, reasonable satisfaction with existing state laws. In California the combined system of riparian rights and appropriation is found embarrassing. In that state storage is necessary, and this results in bringing the water to the riparian owner in different quantities and at other times than it would come in the course of nature, necessitating the obtaining of consent agreements from riparian owners. The doctrine of riparian rights is protected by the constitution and cannot be abolished by the legislature.

The answers received to the question "What influences are retarding the development of water powers in your state?" may be summarized as follows:

1. Influences of a physical character:
  - a. Variable stream flow or lack of continuous supply: Ind., Kan., Penn., Dist. of Col.
  - b. Low heads: Neb., Penn.
  - c. Lack of impoundage: Penn.
  - d. Climatic conditions, such as drought and freezing: Ind., Neb.
2. Influences of an economic character:
  - a. Cheap fuel: Ind., Kan., Penn.
  - b. Market conditions: Md., Nev., Wash., Ark., Ky.
  - c. Cost of money: Ga., Ind., Ky.
  - d. High cost of development: Md.
  - e. High cost of lands overflowed: Iowa.
  - f. Refusal of investors to finance developments under unattractive terms of government permit: Colo.
3. Influences of public policy:
  - a. Tendency of regulatory commissions to keep down service rates: Ga.
  - b. Municipal competition: Wash.
  - c. Conservation policies: Calif.
4. Influences of legislation or lack thereof:
  - a. Inertia of Congress: Calif.
  - b. Government withdrawals: Mont.
  - c. Lack of right of eminent domain: N. Y., Penn.
  - d. Embarrassment resulting from doctrine of riparian rights: Calif.
  - e. Lack of co-operation between states as to interstate streams, especially in relation to the construction in one state of reservoirs which benefit water users in another state: Mass.
  - f. Restrictions as to use of waters of international boundary streams: N. Y.
  - g. Restrictions as to entry on state forest reserves: N. Y.

In answer to the question "What, if any, legislation should be enacted to make available for development the water powers of your state?", answers received from practically every western state specified the passage of the water power bill now pending before Congress. The retarding influences above summarized indicate the character of desired or needed legislation in the different states from which answers were received. Additional answers received were in brief as follows:

1. Placing it beyond the power of any regulatory body so to limit the earnings of utilities that they cannot finance for future needs of their territory served: Calif.
2. Relieving the rate fixing body of its function of "representing the people": Calif.
3. Extending the time when municipalities under Water Commission Act may take over an appropriation for electric power purposes from 20 years to the same period as in Federal permits: Calif.
4. Repealing that portion of the state law which requires payment to the state of  $\frac{1}{4}$  of 1% of the annual gross revenues for the first ten years and  $\frac{1}{2}$  of 1% thereafter: Ark.



5. Authorizing utilities to change their rates, either upward or downward, the changed rates to become effective, subject to review by the Commission on complaint, coupled with a disposition on the part of the public and the authorities to permit rates sufficient to attract capital into the enterprise: Ga.

6. Financial state aid for the construction of the dam, head race and tail race: Ind.

#### Pending National Legislation

The most important national legislation to be expected in the near future affecting water power development, is the



CONSTRUCTION IN THE NORTHWEST

An important development now being carried out by the city of Seattle on the Skagit River. The picture shows the diamond drill at work on the Ruby Dam site.

final passage of the so-called "Water Power Bill" (HR-3184), which was first passed by the House, later amended and passed by the Senate in its amended form, and which is, at the time of writing this report, in the hands of a Joint Conference Committee with good prospects of an early passage.

This bill is the final result of over ten years of controversy and exhaustive hearings and discussions before various committees of Congress in an endeavor to provide a law establishing the conditions under which, and the necessary administrative machinery by which, the water power resources of the country might be developed under terms sufficiently attractive to capital and yet properly safeguarding the public interests.

Briefly the essential features of this bill as amended by the Senate provide for the following:

A. The creation of a federal power commission, consisting of the Secretary of War, Secretary of the Interior, and Secretary of Agriculture.  
B. The detailing of an officer of the U. S. Engineering Corps to serve the Commission as executive secretary and engineer for the Commission.

C. The Commission is authorized to make investigations of and to collect and record data in regard to water resources of the country, water power surveys, industries requiring power, etc.

D. The Commission is authorized to issue licenses not exceeding a term of 50 years, the development to be subject to purchase by the government at the end of that period, with due regard given to severance damages.

E. Provision is made for the payment of permit fees annually by the holders of the permits, such fees to be of sufficient amount to cover the administrative expenses but in no case to exceed 25 cents per horse power.

F. The establishment of rules and regulations governing the conditions under which the act is to be administered by the Commission.

G. Provision is made that the rates and conditions of service of public utility companies operating under permits provided for in this act, are to continue under the jurisdiction of the state public service commission, or in the absence of such a commission, to be applied under the jurisdiction of the Federal Power Commission.

While this bill is perhaps not all that might be desired it will no doubt furnish a sufficiently practical and acceptable basis for the early promotion of various projects now awaiting such legislation.

It is quite possible the bill, with some final modifications, may have become a law by the time this report is presented to the convention. When it does finally become a law, early attention from all concerned will naturally be directed to the broad policy of administration of the Act and the operating details to be established therefor.

#### Permanent Committee on Water Power Suggested

The utmost co-operation between the Federal Power Commission to be established and the electric power industry should be inaugurated and encouraged. Particularly does this apply in the formulation and application of the rules and regulations to be established by the Power Commission in accordance with the Act. On these rules and regulations and on their interpretation and application will depend to a large extent the ultimate success or failure of the purpose of the Act, i. e., the development of the country's water power resources.

It is essential that the electrical industry act as a unit in co-operation with the Power Commission, and, as a means to that end, it is here proposed and recommended to the N.E.L.A. that a permanent committee be appointed to represent the industry in its relations as a whole with the Federal Power Commission.

The work of this committee, if carried along the lines here contemplated, should be of inestimable value not only to the industry but to the Federal Power Commission and to the country at large. It is earnestly hoped, and confidently expected, that the Federal Power Commission will be receptive to such co-operation on the part of the electrical industry and will welcome suggestions and recommendations from men, the broad experience of whom in the financial and engineering phases of water power development, will be of great value to the Commission in the development and application of rules and regulations which will be practical and workable as well as sufficiently adequate to meet the restrictions contemplated by the Act.

#### Present and Potential Water Powers

The present and potential water powers of the United States have been estimated at various times during the past



SKAGIT RIVER DEVELOPMENT

Diablo trail bridge at the damsite, Skagit River Project which is to supplement the present system of the city of Seattle. This is an example of the construction work now under way in all parts of the west.

12 years. The report of the U. S. Geological Survey of 1908 is embodied in the report of the National Conservation Commission, February, 1909 (see Water Supply Paper No. 234 of



the U. S. Geological Survey). The data set forth therein form the basis for a number of subsequent reports on the subject. Explanation is given in considerable detail of the methods by which the estimates of potential and developed water power were made and the figures given, with the more recent adjustments, and additions made thereto, are the most authoritative data available at the present time. In giving consideration to these figures it must of course be borne in mind that calculations on potential water power are essentially approximations only as the ultimate development of any water power project is dependent on a large number of factors such as possible storage development and practical availability of overflow lands, which is impossible of accurate determination in such a preliminary survey and estimate. Even the data on developed water power must necessarily be estimated to some extent, although the Bureau of the Census has from time to time compiled statistics on developed water power, which are so complete as to leave little margin requiring determination by estimate.

For the purpose of analyzing the general power situation, however, the estimates of developed and potential water power, which have been made, are fully sufficient and adequate.

The basic report of the U. S. Geological Survey previously mentioned has been amplified and readjusted from time to time as more recent data became available, and the latest reliable estimates, both of developed and undeveloped water power in the United States, may be obtained from a joint consideration of the U. S. G. S. estimate of 1915 and the estimate recently made by the Electrical World as of January 1, 1920. The latter has used as its basis the 1915 estimates of the U. S. G. S. and is the result of a careful study of water power reports issued by engineers of the Geological Survey since 1915, reports of other federal departments, state conservation and surface water reports, as well as private engineering reports. Corrections to the Geological Survey estimate of 1915 have been made based upon these various later reports.

This statement gives both the U. S. Geological Survey estimate of 1915 and the more recent estimate of the Electrical World as of January 1, 1920. The two are not materially different and for purposes of comment on the figures shown, reference will be made only to the figures of the more recent Electrical World estimate.

Development in Western States

In an examination of this tabulation attention is first attracted to the fact that 68.6 per cent of the potential maximum horse power of the United States lies in the western states (the Pacific and Mountain States of California, Oregon,

Washington, Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming). In connection with these percentages it is also of interest to note that, of the total maximum potential water power of the United States, 74.3 per cent represents undeveloped horse power coming under federal jurisdiction, i. e., lying on federal reserve lands or on navigable streams wherein federal permits are required. In the western states 94 per cent of the maximum potential water power is in this class. These percentages are from "Facts About Water Power" prepared and published by the Executive Committee of the Water Power Development Association. In other words, practically all of the future developments of water power in the western states (covering approximately 70 per cent of the total potential water power of the country) will be dependent upon federal action in the matter of issuance of workable permits for the development of these projects.

It is also of considerable interest and significance to note that, in the United States as a whole, only 16.6 per cent of the maximum potential water power has been developed up to the present time. For the western states alone this proportion is only 6.5 per cent. In other words, the maximum potential water power of this country has, to date, been developed only to the extent of one-sixth of the total possible, and, in the case of the western states, only about one-sixteenth of the possible water power has been utilized.

The Factor of Storage

While it is true that the figures here given for potential maximum water power include water powers which are not at the present time within the range of economic development, it is also true that these figures do not include the additional water power which would be made available at some of the power sites by the development of seasonal storage reservoirs. This latter feature of water power development is a factor which is not susceptible of a definite estimate from the data at present available. The values here shown for potential maximum horse power represent values of six months' continuous horse power, i. e., the minimum horse power available for the maximum six months' flow during the cycle of a year, without consideration of the possibilities of seasonable storage reservoirs. While, as previously stated, no definite estimate can be made of the total additional water power which might be made available by the inclusion of seasonal storage, some idea can be obtained of the effect of such storage on the total potential water power available. It has been roughly approximated, from the limited data available, that something like 200,000,000-hp. would represent the possible maximum potential horse power with maximum storage facilities developed and utilized, as compared with approxi-

TABLE NO. 1—WATER POWER OF UNITED STATES

	U. S. GEOLOGICAL SURVEY ESTIMATE OF 1915					ELECTRICAL WORLD ESTIMATE, JAN. 1, 1920				
	POTENTIAL		MAXIMUM	DEVELOPED		POTENTIAL		MAXIMUM	DEVELOPED	
States	Horse power	Per cent of total potential of U. S.	Horse power	Per cent of total developed of U. S.	Per cent of max. potential of district	Horse power	Per cent of total potential of U. S.	Horse power	Per cent of total developed of U. S.	Per cent of max. potential of district
Western States (Pacific and Mountain).....	42,850,000	67.5	2,580,000	29.7	6.0	40,701,000	68.6	2,664,990	27.1	6.5
New England States.....	1,921,000	3.0	1,441,000	16.7	75.0	1,951,000	3.3	1,506,500	15.3	77.2
Atlantic States.....	10,922,000	17.2	3,019,000	35.0	27.7	9,348,000	15.7	2,952,850	30.0	31.6
Central States.....	7,797,000	12.3	1,589,000	18.6	20.4	7,360,000	12.4	2,699,200	27.6	36.7
TOTAL U. S.....	63,490,000	100.	8,609,000	100.	12.7	59,360,000	100.	9,823,540	100.	16.6

TABLE NO. 2—WATER POWER OF WESTERN STATES

		U. S. GEOLOGICAL SURVEY ESTIMATE OF 1915			ELECTRICAL WORLD ESTIMATE, JAN. 1, 1920						
		POTENTIAL	MAXIMUM	DEVELOPED		POTENTIAL	MAXIMUM	DEVELOPED			
States		Horse power	Per cent of total potential of U. S.	Horse power	Per cent of total developed of U. S.	Per cent of max. potential of state	Horse power	Per cent of total potential of U. S.	Horse power	Per cent of total developed of U. S.	Per cent of max. potential of state
California		9,250,000	14.6	910,000	10.6	9.8	9,250,000	15.6	942,000	9.6	10.2
Oregon		7,000,000	11.0	280,000	3.2	4.0	7,100,000	12.0	248,000	2.5	3.5
Washington		9,500,000	15.0	570,000	6.6	6.0	9,500,000	16.0	361,000	3.7	3.8
Arizona		2,000,000	3.1	34,000	0.4	1.7	1,698,000	2.8	67,600	0.7	4.0
Colorado		2,000,000	3.1	190,000	2.2	9.5	1,850,000	3.1	238,000	2.4	12.8
Idaho		6,000,000	9.4	160,000	1.9	2.7	6,110,000	10.3	89,400	0.9	1.5
Montana		4,500,000	7.1	250,000	2.9	5.6	4,250,000	7.1	395,000	4.0	9.4
Nevada		250,000	0.4	33,000	0.4	13.2	250,000	0.4	55,500	0.6	22.2
New Mexico		300,000	0.5	3,000	.....	1.0	320,000	0.5	650	.....	0.2
Utah		1,250,000	2.0	125,000	1.5	10.0	1,320,000	2.2	263,000	2.7	19.9
Wyoming		800,000	1.3	5,000	.....	0.6	750,000	1.3	4,840	.....	0.6
TOTAL WESTERN STATES		42,850,000	67.5	2,580,000	29.7	6.0	40,701,000	68.6	2,664,990	27.1	6.5
TOTAL U. S.		63,490,000	100.	8,609,000	100.	12.7	59,360,000	100.	9,823,540	100.	16.6



mately 60,000,000-hp. which, in the above tabulation, is considered as the potential maximum horse power available.

#### East of the Rockies

In the case of the central and eastern states, particularly the New England states, it is shown that a comparatively large portion of the potential water horse power has been already developed. In the case of the New England states the high percentage of 77.2 per cent already developed shows that little additional water power development is to be expected in this district. Future developments here will consist chiefly in the more efficient utilization of the water powers already developed. Such increase in efficiency will be accomplished largely by co-ordination and unification into a comprehensive system of the numerous small developments which have been established here for a number of years. More will be said on this subject in another part of this report.

#### Comparative Developments in West

Inasmuch as the western states represent such a very large proportion of the potential maximum water horse power of the country, interest is naturally directed to this group. Table 2 shows in detail by states the potential maximum horse power and the developed horse power of this group.

Particular attention is directed at this point to the developed horse power of these western states. Using again the Electrical World figures, California is shown well in the lead with a present development of 942,000-hp., which is 10 per cent of the entire developed water horse power of the United States. It is, however, only 10.2 per cent of the maximum potential water power possibilities of that state. While Washington shows the largest maximum potential water horse power of any state in the Union it ranks among the western states below both California and Montana in the amount of developed water horse power, showing only a development of but 3.8 per cent of its potential maximum possibilities and only 3.7 per cent of the total developed water horse power of the country. Oregon also shows wonderful potential water power possibilities, and, up to the present time, only a very low percentage of development, 3.5 per cent of the maximum possibilities of the state. These figures clearly show that, although the West has already developed some remarkable water power projects and is well up in the lead in the development of large interconnecting networks of transmission systems, the water power development in this section is however but begun.

#### Western Transmission Lines

With this report is exhibited a map of existing western transmission lines. A glance at this exhibit, with a realization of the territory covered, gives a conception of the great distances involved in western transmission. Interconnections between systems have completed the circuit until there is now an unbroken connection from Medford, Oregon, on the north, down to Los Angeles on the south, thence to the Mexican border line, and from Los Angeles on northward into Nevada—an extent of over fourteen hundred miles, a distance as great as that from New York to Omaha, or from New York to Jacksonville, Florida. The interconnection in the North-

west that exists in the operation of the Chicago, Milwaukee & St. Paul Railway, which is now electrified over the Cascades and Rocky Mountains, gives another instance of long distance interconnected service; for this railroad from Harlowtown, Montana, on the east, to Seattle on the west, will make a solid chain of copper of some eight hundred and three miles when the remaining power interconnection of one hundred and fifty miles in eastern Washington is completed during the forthcoming summer.

#### Centers of Activity

Looking again at this map it is observed that the network of transmission usually clusters about some great city or industrial center. Thus we have the power lines of the Southern California Edison Company coming down to Los Angeles from Big Creek, a distance of two hundred and forty miles north, at a voltage of 150,000; together with a number of other high-powered lines, which come into Los Angeles from various distances. The area served by this one company is so vast that were it superimposed upon the two hundred and forty operating companies in New England, this one company would outdo them in extent of area served. On to the north the district in and about San Francisco constitutes another interesting phase of development wherein will be found even greater areas served than that by the Edison Company. Here the Pacific Gas & Electric Company and the Great Western Power Company combine in an unusually large system. In fact, during the war period, this interconnected system with the Sierra and San Francisco Power Company, comprising the three companies then serving San Francisco, which as a war measure were placed under one operating management, had the greatest power output ever recorded in the United States up to that time, overtopping even that of the Commonwealth Edison Company of Chicago. The interconnected companies feeding San Francisco in the war period generated over 1,500,000,000 kilowatt hours of energy, while the Commonwealth Edison Company generated something less than 1,500,000,000 kilowatt hours during the same period. No more extensive system of distribution of electric service is to be found than that in and about the San Francisco district.

These statistics from April 1, 1917, to March 31, 1918, are as follows:

Pacific Gas & Electric Company.....	1,500,408,765
Great Western Power Company.....	
Sierra & San Francisco Power Company.....	1,488,080,000
Commonwealth Edison Company.....	
Niagara Falls Power Company.....	1,188,221,770
Ontario Power Company & United Electric Light and Power Company .....	
Montana Power Company.....	954,913,584
Montreal Light, Heat & Power Company.....	947,732,014
Hydraulic Power Company.....	946,832,817
Toronto Power Company.....	871,563,138
Southern California Edison Company.....	800,638,000
	794,687,405

Farther up to the north and east, about Portland, Oregon; Seattle and Spokane, Washington; Butte, Montana; Boise, Idaho, and Salt Lake City, Utah, are to be found similar high tension networks and vast distribution systems of hydroelectric energy serving in the development of agricultural empires and industrial centers in the embryo.



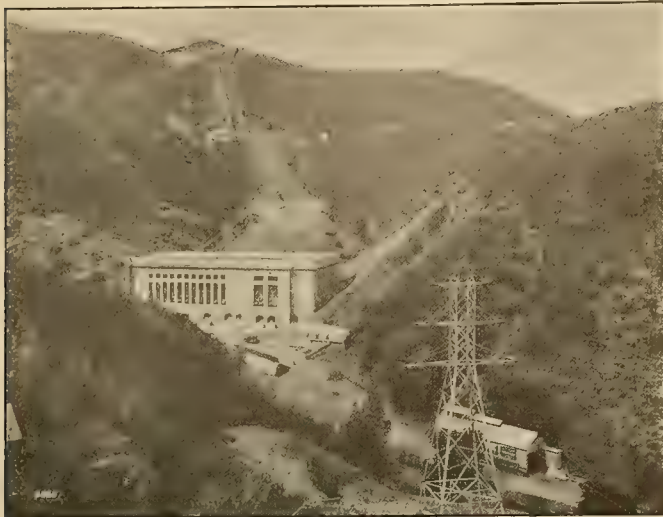
CONSTRUCTION UNDER WAY IN IDAHO

The Idaho Power Company is now installing a 6000-kw. turbine in its Thousand Springs Station. The increased demand for power during the last year in this region has been unusually great and is expected to continue.



### Magnitude of Engineering Problems

In any discussion wherein actual development of western water power is to be considered, it must not be overlooked that the topography of this region frequently necessitates the solution of problems unprecedented in engineering practice. It is as a consequence, timely and to the point that mention be made at this time of some of these feats in engineering that have been accomplished in the far west, in order that



**SAN FRANCISQUITO PLANT**

No. 1 San Francisquito Plant of the Los Angeles Bureau of Power and Light. Construction on the No. 2 Plant is now under way and it is expected that a 20,000-kw. unit will be ready this summer.

we may get a clearer conception of the vastness of the problem involved and what has been accomplished in the development of hydro-electric energy throughout the West.

### A Popular Misconception of Waterpower in the West

Waterpower development in the West, in the main, has not followed the popular conception of such enterprise. The general conception of a power project involves the harnessing of a waterfall, such as Niagara, or of lesser magnitude, as the case may be. The typical western development usually involves no waterfall of any size. The power project is located in a mountain canyon where either a reliable minimum flow of the stream may be found the year round, or else storage is developed, above the point of such diversion. Such a power site may not require a waterfall at all, but merely rapids in a stream. The water is diverted by a ditch, flume or tunnel and conducted around the mountain side at a less grade than that of the stream. When this is continued for many miles it is evident that a difference in level will occur between the water in the ditch and that in the natural run of the stream. As a consequence at the end of two to fifteen miles of ditch, flume, or tunnel, we have a drop of from one hundred to even as high as twenty-five hundred feet. Such artificially created waterfalls are more typical of western development than the utilization of a natural fall.

### Western Records

The mountainous situation of these developments, the tremendous heads which it has been possible to develop and the great distances involved in the transmission of power to the centers of population have demanded both originality and daring in the engineers who have been called upon to meet the problems, with the result that precedent has often been disregarded and history written along many lines of engineering achievement.

Among the records which typify the magnitude of western development may be mentioned the following:

#### Hydroelectric Generation

The largest single discharge turbine in the world: 20,000-hp.—Wise Power Plant, near Auburn, California; Pacific Gas & Electric Company.  
The most powerful high-head turbine in the world: 23,800-hp.—White River Plant, near Seattle; Puget Sound Power & Light Company.

A unit of practically similar size is installed in the Long Lake Plant, near Spokane, Washington; Washington Water Power Company.

**Other large units:** Southern California Edison Company is installing two 22,500-hp., 800-ft. head Francis reaction type turbines in its Kern River No. 3 plant, while the Great Western Power Company will install impulse wheels under 1008-ft. head at its Caribou plant on the Feather River with capacity of 30,000-hp.

**The highest head plant in America:** The San Joaquin Light & Power Corporation plans two units under 2500-ft. heads in connection with its King River project, already begun, and a similar head is contemplated by the Southern California Edison Company in the Big Creek development.

**Typical also of western construction** is the 17-ft. section tunnel being driven by the San Joaquin Light & Power Corporation to serve its Kerckhoff plant, a world's record in dimensions for hydroelectric tunnels, a steam shovel being used in mucking inside the tunnel.

#### Transmission

**First long distance transmission:** 20 miles at 10,000 volts from San Antonio to San Bernardino, California.

**Longest high voltage transmission:** 87,000 volts and 55,000 volts, 539 miles, from Mono County, California, to Yuma, Arizona; Southern Sierras Power Company.

**Highest voltage transmission:** Present record, 150,000 volts, 240 miles, Big Creek to Los Angeles; Southern California Edison Company. The Great Western Power Company is now installing a 165,000-volt line from its Caribou plant to San Francisco. The Pacific Gas & Electric Company has in contemplation the building of a 220,000-volt line from its Pit River plant into San Francisco, while other western companies are planning 220,000-volt lines for the near future.

**Long span aerial crossing:** Carquinez Straits; Pacific Gas & Electric Company. 6 steel lines, 4427-ft.—for a long time the longest in the world, now second longest.

**Longest high voltage submarine cable:** 3½ miles, 11,000 volts; Oakland to San Francisco; Great Western Power Company.

#### Dam Construction

Other records have been attained in the construction of dams in electric and related water development projects, a few of which may be mentioned here.

**Highest dam in the world:** Arrowrock, Idaho, 346½-ft.

**Greatest storage of water in America—second in world:** Elephant Butte, New Mexico, 2,638,868 acre-ft.

**Second greatest storage of water:** Roosevelt, Arizona, 1,367,300 acre-ft.

**Highest rockfill dam:** Morena, near San Diego, California, 267-ft.

#### Steam Generation

Steam is of course used throughout the western region for standby purposes and in some sections of the West it still proves the more economical source of power. Taking the district as a whole, however, hydroelectric generated power far exceeds steam generation, the proportions being about 75% hydroelectric to 25% steam. It is nevertheless of importance to point out the predominance of fuel oil as a fuel in the



### NORTHWEST WATER POWER

One of the important hydroelectric developments of the Portland Railway, Light & Power Company. Washington and Oregon together have 16,600,000-hp. of the 59,360,000 potential horsepower of the entire United States. Less than 4% of the power possibilities of these two states have been developed to date.

southwest region and California, as well as to call attention to such economy records as that made by the Arizona Power Company, where a record of 333.3 kilowatt hours per barrel of oil is said to have been obtained. With the program of construction in the development of water power now under way, and planned for the coming ten years, however, steam generation will become a still more minor factor in the electric service of the west, except for standby purposes.

### Power Consumption Data

The power consumed in various sections of the country makes interesting comparisons. It may be noted



TABLE NO. 3

District.	Population	Millions kw. hr.	Million dollars gross rev.	Kw. hr. per capita	Cost per kw. hr.	Revenue per capita
New England.....	9,448,000	2,398.6	64.47	254	\$0.0293	\$ 6.82
Atlantic.....	36,798,000	13,340.5	304.71	363	0.0228	8.24
Central.....	54,222,000	14,688.1	299.02	271	0.0204	5.52
Western.....	9,375,000	6,307.5	104.80	673	0.0166	11.17
TOTAL.....	109,843,000	36,734.7	773.00	334	0.0212	7.05

that the western states have the highest per capita consumption and the lowest rates of any, due to the available water power. The data in Table 3 is for the year 1919.

Comparing the uses of electricity in the west it is thus to be seen that the per capita use of electricity in the far western states is 2.21 times that of the remainder of the nation. Again it is interesting to note that while distances are vast, the development of long distance hydroelectric transmission has made possible electric power rates that are extremely low, averaging 1.66 cents per kw-hr., as compared to 2.19 cents per kw-hr. obtaining elsewhere in the country. In spite of these low rates the income to the power company per capita is almost twice that east of the Rockies.

Figures made public on April 8, 1920, by the Department of the Interior, gives some startling comparisons:

## JANUARY, 1920, OUTPUTS

Nine western states.....	477,833,000-kw-hr. by water power
All other states.....	796,568,000-kw-hr. by water power
Nine western states.....	161,214,000-kw-hr. by fuels
All other states.....	2,418,984,000-kw-hr. by fuels
Nine western states.....	639,047,000-kw-hr. total
All other states.....	3,215,552,000-kw-hr. total

## PER CAPITA CONSUMPTION

Nine western states.....	54.8-kw-hr. per capita from water power
All other states.....	8.12-kw-hr. per capita from water power
Nine western states.....	18.5-kw-hr. per capita from fuels
All other states.....	24.6-kw-hr. per capita from fuels
Nine western states.....	73.3-kw-hr. per capita total
All other states.....	32.72-kw-hr. per capita total

This table shows that the per capita consumption in the western states, of energy produced by water power, is 6.75 times that consumed in all the other states. The per capita consumption of power from both fuel and water power in the western states is 2.24 times that of the other states. This consumption of water power energy is particularly striking in that it is the result obtained in a dry year, as under normal rainfall the production of a large part of the energy now produced by fuel would have been supplanted by water power and given a still higher ratio between the per capita consumption in the West as against the East.

## Distribution of Potential Water Power

Attention is directed again to Table 2, which shows the potential water powers of the western states in detail, together with the development water power data for these states which has already been discussed.

Of the total potential water power of the United States the State of Washington stands first with 9,500,000-hp., or 15 per cent of the total potential water horse-power of the United States. California is a close second with 9,250,000-hp., or 14.6 per cent of the total United States. Oregon ranks third with 7,000,000-hp. or 11 per cent of the total of the United States. These three Pacific Coast states together represent 40.6 per cent of the total potential maximum horse-power of the United States. Including the states of Idaho and Montana, these five typically western states represent 57.1 per cent of the total potential maximum water horsepower of the United States with a total of 35,750,000-hp. These figures all clearly emphasize that the problem of future water power development is quite distinctly a western problem, and this is stated without detracting in any way from the wonderful developments which have been accomplished in the East.

## Developments Contemplated in Eastern States

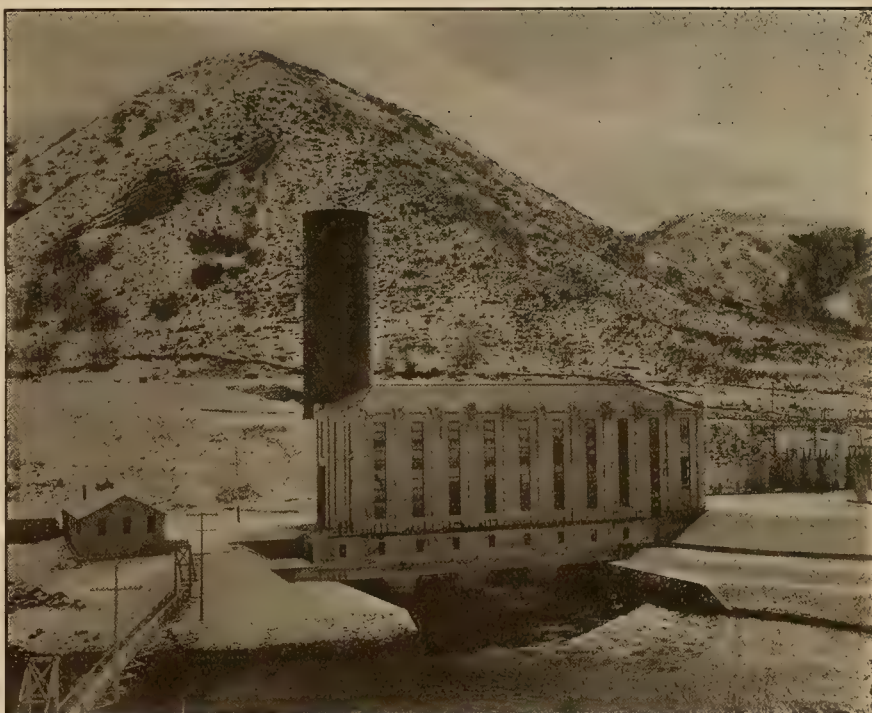
In the eastern states some large developments are contemplated on navigable streams. Over 1,000,000-hp. is contemplated in the states of Alabama, North Carolina, Georgia, and Maryland. At some future time it is to be expected also that economic conditions will force the further development of Niagara Falls, of which approximately 75% remains still undeveloped. Increased efficiency of existing plants through interconnection of plants and development of storage facilities is to be expected in the near future.

The electrification of the trunk line railroads of the western section of the United States will require the development of a portion of the water powers of that territory. In the carrying out of this electrification, transmission lines will of necessity run along the railway lines and pass through the centers of population adjacent thereto. These lines should thus readily become the interconnecting links between local networks. The railway electrification, therefore, in addition to creating a new market for electric power will be an agent in the creation of a large network.

The future growth of water power developments can come only with growth of load of which more will be said later.

## A 20,000-KW. PLANT ON THE UTAH SYSTEM

The Oneida Hydroelectric Plant of the Utah Power & Light Company, which is designed for an ultimate capacity of 40,000 kw. The industries of Utah are largely those of mining and agriculture, both of which are large consumers of electricity.





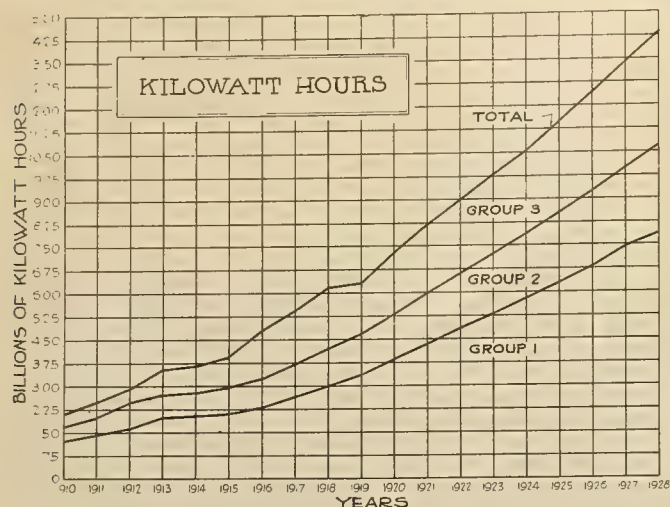


Fig. 1.—The steady growth of the output of the western companies is graphically indicated by the above curves which show the total annual output increasing from 2.05 billion kw-hr. in 1910 to 6.25 billion kw-hr. in 1928. Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

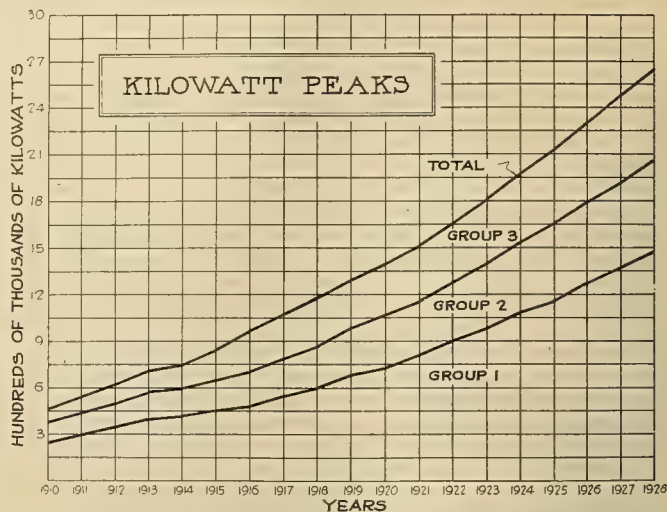


Fig. 2.—The curve of kw. peaks is the total of the several companies and does not represent the peaks which would occur if the companies were completely interconnected. Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

### Future Growth to be Anticipated in Power Development

In order to get accurate data on power possibilities, or rather power to be anticipated during the next decade, a questionnaire was sent out to all the fifty-two power companies in the far western states calling for a statement of their load during the past ten years, and also their estimated load up to, and including, 1928. Superimposing these various load charts, one upon the other, we arrived at the interesting conclusion that during the next ten years the expected development of power in the West will rise to the vast total of 1,776,260-kw. At present-day prices the investment capacity at power plants is running in the neighborhood of \$200 per kw. The transmission, transformation and distribution expense and incidentals involved in properly marketing the product, will entail an additional expenditure of some \$200 per kw.

Thus it is readily seen that something like \$710,510,000 must be expended in the West before 1929 to meet the situation. While this vast amount of capital is necessary as a prime source of development, it is easily seen that such development will carry along with it an equal call for electrical installation in appliances in the home, upon the farm, and in industry, that may well total an equivalent amount. We are principally concerned, however, with the question of the first three-quarter billion, for with that secured the remainder finances itself. Indeed, so important, not only to the continued prosperity of the power companies involved, but to the nation itself, both East and West, is the problem of water power development, that it is not overemphasizing the matter to state that the most vital question before this convention is the securing of that \$710,510,000, as well as the millions needed for developments east of the Rockies—in short, the question of financing.

### The Self-Interest Appeal

Recent interest in the West has been focused on what has become known as the "self-interest" appeal. From a well known power company the following data has been supplied as taken from the records required by the regulatory body of the state wherein the power company operates, in which capital in former years for power development was distributed as shown in Fig. 9.

Examining the details of this chart we may with reason predict to what extent various subdivisions of industry will be interested in the investment of this \$710,510,000. Thus the transformer man knows that 7½% or \$53,000,000 of this money will go to his business; and so on down in other branches of the industry, the copper man, the fabric man, and

indeed all the allied and side industries that go to make up or furnish supplies for the manufacture of electrical apparatus involved. To the man in the street too, the problem is of unique interest and may be made to appeal to him personally. One instance will suffice: In the district surrounding Fresno, California, two thousand applicants for power for farm development cannot at the present time be connected upon the power lines due to insufficient power installation. In former years it has been found that in that district for every farm delayed in development in the country two homes in the city are delayed in construction. Investigation shows that the average home in and about that vicinity has a value of some \$5000. Thus it is seen that \$10,000,000 in construction is delayed at the present time in that one community due to the inability of the power companies to furnish this power. The tabulation in Fig. 10, taken from builders' records, represents the various channels wherein money for construction and building purposes in the city is disbursed in that particular section.

### Water Power Development Essential to Western Growth

Even a casual survey of this chart brings to light the fact that the plasterer, the overall man, and indeed every form of labor and industry is vitally affected when stagnation in the power industry occurs. While conditions in other sections of the country may vary in detail from this, it is everywhere demonstrable that local stagnation follows a failure of electric generation to keep pace with the building of the empire it serves. With the tremendous growth of the West—in California alone applications for water to irrigate an additional acreage equal to 50% of the total already under cultivation have been filed in the last six months—combined with the high price and diminishing supply of fuel, it is obvious that for this region it means that the development of the country is dependent on hydroelectric development—dependent, in other words, on the financing of the three-quarter billion construction planned.

### Western Power Application, Present and Prospective

A like evidence of the dependence of western growth upon electricity and also of the certainty of a tremendously growing demand in the future is the survey of western industries.

In the intermountain region where mining and agriculture share the prosperity of the country, both are largely dependent upon electricity. Such examples as the vast electric pumping irrigation project at Minidoka, Idaho, and the electrified mines of Montana, Idaho and Utah, largely account for the high per capita use of this district.



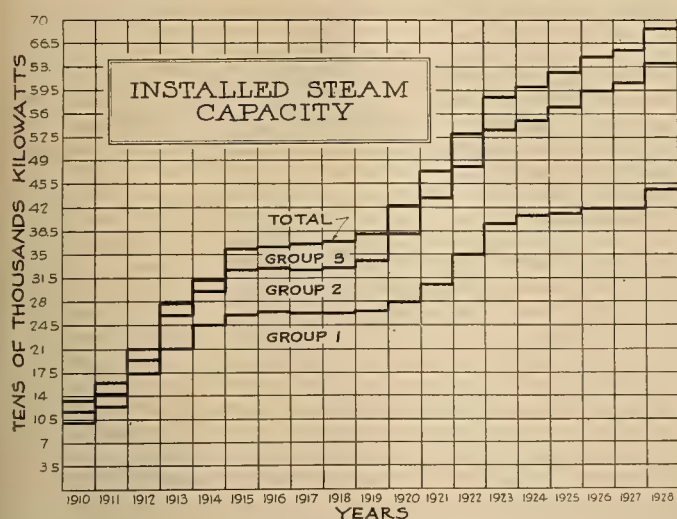


Fig. 3.—The flattening out of the installed steam capacity curves indicates that the hydro capacity is expected to more nearly meet the load demands, steam capacity still being sufficient to give service. Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

In the Northwest, paper mills find the electric drive indispensable, and in the lumber industry also first experiments in electric logging have shown electricity to be more economical than previous methods, and the electrification of sawmills is becoming quite general.

#### Electro-Chemical Possibilities

Large quantities of copper, lead and zinc are mined and smelted in the western states. These are shipped to eastern refineries. Due to the increasing cost of power in the East and the fact that these refineries must compete with industries in which the cost of power is a smaller item of the total cost of production, we may expect an enlargement of the existing refineries and the installation of additional refineries in the West in the near future. The electrolytic zinc plant now located at Great Falls is the largest in the world and has a daily capacity of 150 tons of the highest grade of zinc.

We may also expect an increased consumption of electric power in electric furnaces for the production of alloy and steel which already forms a considerable load. There is a possible future use for electricity in the development of the chemical resources of the West. Advancements in technology have made possible the use of reagents in these industries that can be produced by electric energy. These developments will, of course, require co-ordination of certain chemical industries and close co-operation with the power companies.

#### Present and Future Agricultural Load

The primary basis for western prosperity, however, undoubtedly lies in its agricultural development and here electricity has played a most important part. Due to the general arid climate with an absence of summer rains which prevails throughout the greater portion of the region, particularly the Southwest, irrigation is an essential to the cultivation of the soil. Gravity irrigation is, of course, used to the fullest extent, but it is inadequate to supply the need and is being supplemented in steadily increasing degree by electric pumping. To this consideration may be attributed the fact that California uses more electric power on the farm than all the rest of the United States put together, the remaining western states ranking second.

An example of the importance of electricity to this development is to be seen in the rice industry, now one of the important crops of California, which depends almost entirely on electric pumping for its existence. This industry was not started until 1912, but a \$27,000,000 crop was shipped from the state in 1919 and the only bar to a 25% greater acreage in 1920 is the shortage of electric power, a striking

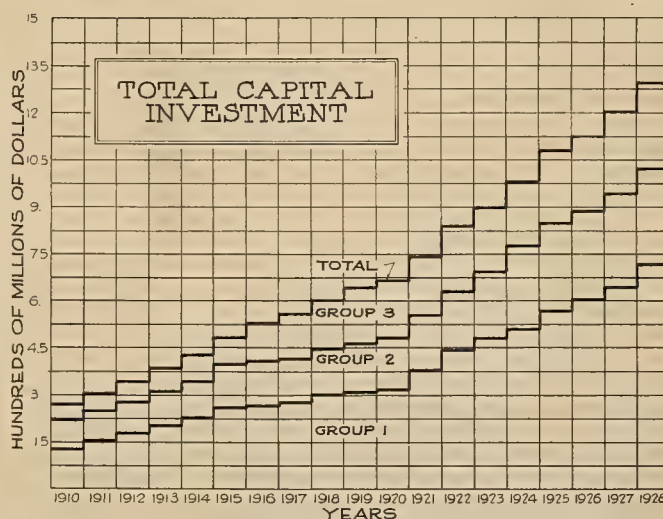


Fig. 4.—The curves of capital investment are based on an estimated investment of \$400.00 per kw. for the total system. At the end of 1928, this investment will reach \$14,250,000,000.00.

Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

example of the dependence of agricultural growth upon hydro-electric development.

There are in addition, various important but nevertheless minor industries in the region, listed in the census reports as 7% of the manufacturing activity of the United States, all of which are to a great extent users of electricity. It should be pointed out, however, in favor of the stability of western power demands, as well as the importance of electrical development to western growth, that the major industries already mentioned are essentially dependent upon electricity, whereas in the average manufacturing interest, it is a factor of smaller relative importance. Thus the abundance and cost of electric energy is the determining factor as to whether such enterprises as additional irrigation, electro-chemical propositions, or activities involving the use of the electric furnace shall or shall not be undertaken.

#### Pooling of Power Resources

During the war it was found necessary, in order to increase production, to pool the resources of the nation. Power for operating our industries was demanded as never before and on very short notice. One of the expedients resorted to in keeping abreast of these unprecedented demands was the pooling of power resources through physical interconnection of adjacent systems.

New experiences were encountered and many economies were effected. Those who came in contact with the larger aspects of these war problems and participated in working out their solutions learned that the methods developed and applied under the stress of war were in fact destined to become of even greater importance under conditions of peace.

There is, therefore, as a result a well-defined movement at the present time looking to the unification of the power systems of certain sections of the country, a movement which, once it gets under way, will gradually spread over the entire country.

We have passed successively through the periods of the isolated plant, the individual central station plant, with its more or less limited distribution lines, and are now in the period of the central station system of a number of generating plants, hydro and steam, connected to the transmission network of the utility. The next period is to be that of the unification of the power resources of large subdivisions of the country.

In this unification plan the entire power requirements of the district, comprising at first possibly a single state, later several states and eventually the entire country will be treated as a co-ordinated whole. The power and light, and possibly the heat for the factory, the mine, the locomotive



on the rails, and all household requirements, will be fed from networks of immense proportions extending great distances and deriving energy from generating plants containing the most economical prime movers located at points where low priced fuel or water power is available. Such trunk systems, due to the diversified use of energy by the great variety of users served, and because of the ease with which energy

higher efficiency, as there would be an outlet for all that the plant could put out during the seasons of high water and at the same time catch, in such impounding reservoirs as there might be available, excess flood water. This would mean the highest possible yearly load factor for the hydro plant—a very important matter because of the relatively high fixed charge.

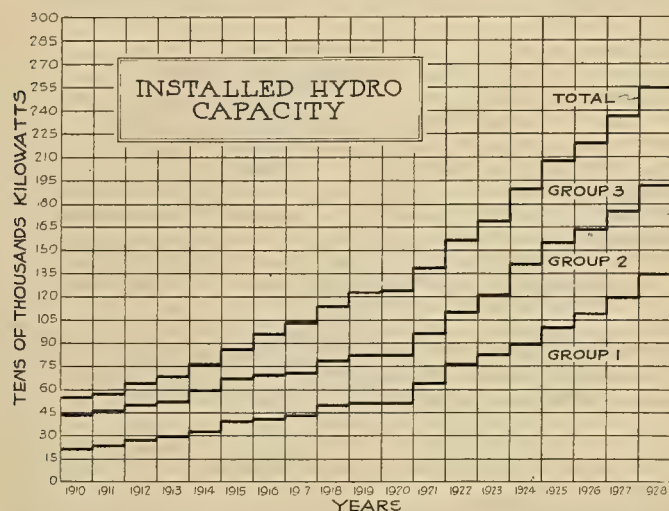


Fig. 5.—After the post-war period of 1919-1920 the rate of increase of hydro capacity shows a steady growth.

Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

from flood waters on one system might be absorbed, thereby making possible the impounding of the maximum amount of water on another system, and because of the ability to absorb energy produced by regeneration of electric locomotives on descending grades, will operate at a very high load factor and the cost of producing energy will be at a minimum figure.

#### Advantages of Local Diversity

The diversity in use between individual networks, many of which would be fed from the trunk system, would be of immense advantage in keeping down to a minimum the capacity and investment in generating plants required.

Seasonal variations in climatic conditions would be taken advantage of through the interconnecting network and would result in a steady supply of power in certain sections, on the watersheds of which for the time being there might be serious water shortage.

Such trunk systems would fit in admirably with hydroelectric development and the utilization of large units of

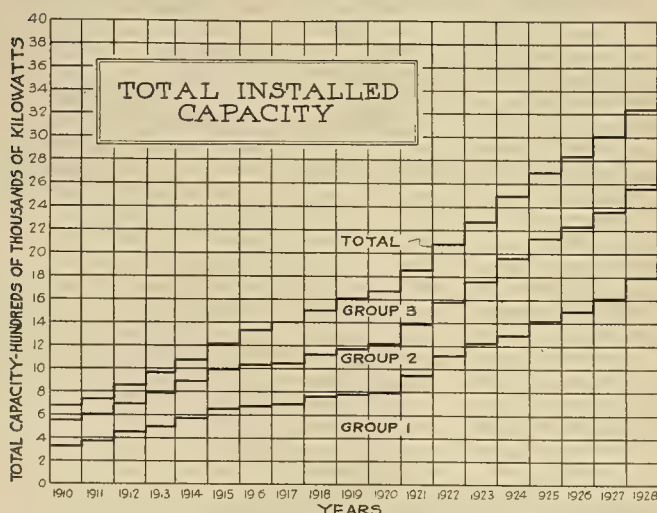


Fig. 6.—The total installed capacity is a composite of the hydro and steam capacities and shows almost a straight line growth for the next decade.

Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

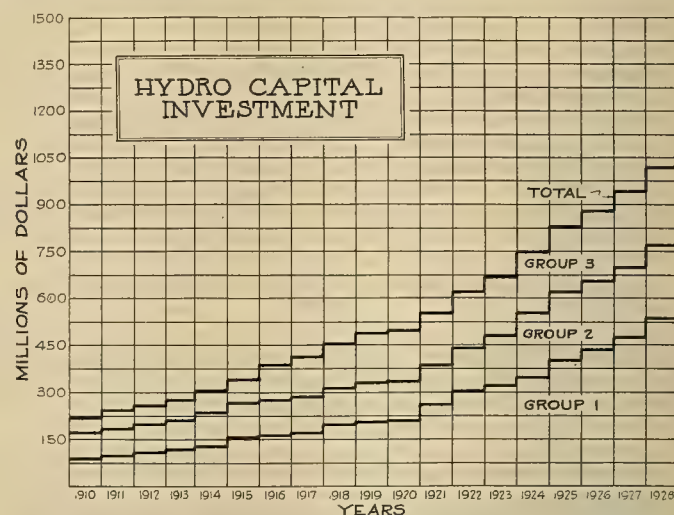


Fig. 7.—The above curves of hydro capital are based on an investment of \$400.00 per kw. of capacity which covers plants, lines and substations for placing this power at the disposal of the consumers.

Group 1, California district; Group 2, Northwestern district; Group 3, Mountain district.

#### Conservation of Fuel Oil

Another phase of such an interconnected system is the possibility of fuel-oil saving, which in the Pacific Coast states is rapidly becoming an imperative necessity.

The fuel oil situation in the western states has been recently set forth quite clearly by Mr. K. R. Kingsbury, president of the Standard Oil Company of California, in an open letter to the California Railroad Commission explaining the causes leading up to the recent increase in prices of fuel oil and gasoline.

The following extracts from this statement are representative of the situation:

"The Pacific Coast supply of fuel oil and of petroleum products is rapidly approaching exhaustion. Since May 1, 1915, crude oil stocks in California have decreased from over 60,000,000-bbl. to 28,738,921-bbl. on March 1, 1920.

"The available supply of crude oil in stock is today less than 13,000,000-bbl.

"The balance of the stocks are taken up in the factor of safety of 10,000,000-bbl., which the Petroleum Committee of the State Council of Defense found essential to the safety of Pacific Coast industries, and in the oil in pipe lines and tank bottoms which the same committee estimated at 6,000,000-bbl. not available for use.

"At the present rate of consumption and of production the available stock will be exhausted in about 12 months, at which time consumers of California fuel oil will be cut off from between 25,000 to 30,000-bbl. per day.

"The condition is not a temporary one but the culmination of a steady growth."

A great deal of additional information on the subject is given in Mr. Kingsbury's statement.

The point that we are chiefly concerned with in this connection, however, is the possibility for hydroelectric systems to assist in the conservation of fuel oil supply.

The two largest central station companies in the State of California have found it necessary, in spite of their large hydroelectric developments, to consume oil at a rapidly increasing rate, as shown by the following totals for the two companies:

	Barrels of oil consumed
1916	1,047,886
1917	1,596,149
1918	2,073,016
1919	3,088,145

While this consumption of these two central station companies represents only a small portion of the total consumption for all purposes in the local market it does reflect the trend in the increase of fuel oil consumption.



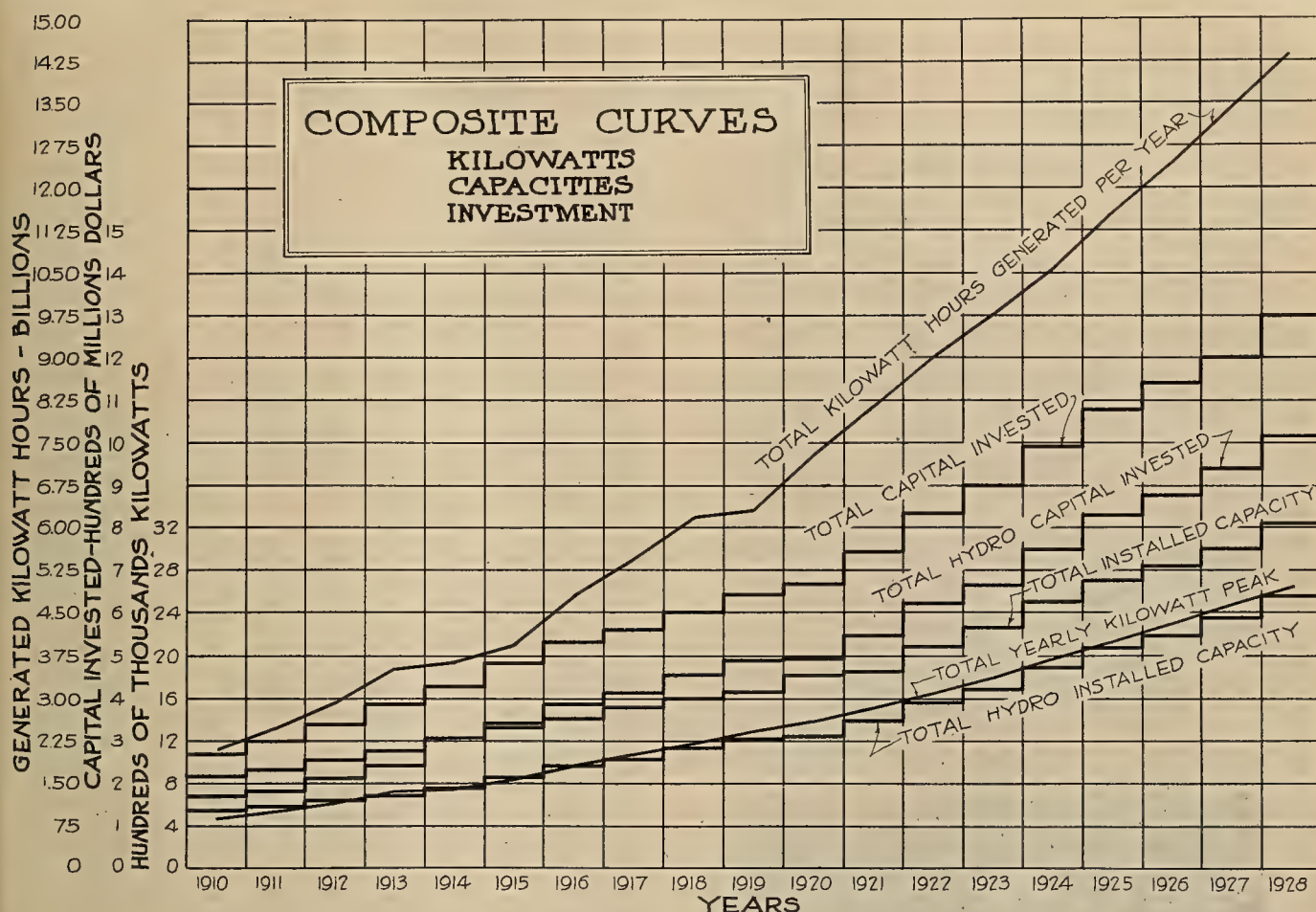


Fig. 8.—The above figure is a composite of Figs. 1 to 7. It should be noted that the kw. peaks are only slightly greater than the total hydro capacity installed indicating that little fuel will be burned. The curve of total hydro capital is based on an investment in power plants, transmission lines and distribution systems of \$400.00 per kw. installed hydro capacity. The curve of total capital is based on a total of \$400.00 per kw. of both hydro and steam capacity.

### Auxiliary Benefits

Further development of hydroelectric power will mean not only an important direct saving in fuel consumed by the central stations, but also a much larger saving in fuel consumed by other large power users in California, who would utilize electric power if it were available. The power shortage makes this impossible under present conditions.

The power shortage at present existing in California does not prevail in the other states of the West, but the demand for power in the other western states is rapidly approaching the maximum capacity of the central stations therein, and if further development is not vigorously pushed the power shortage conditions of California will be duplicated in practically every western state.

It is furthermore becoming of importance that the remaining supply of crude oil be conserved in so far as possible for its more valuable products of gasoline, mineral oils, asphaltum, etc., and for such uses as marine fuel and other power purposes where electric power from hydro plants is not available. This represents the highest type of conservation and its ultimate development lies in the maximum utilization of hydroelectric power and the transmission and distribution of this power through a comprehensive interconnected system providing for the highest and most efficient use of the generating plants.

### California Trunk System

At this point it is of interest to note that much has already been accomplished in California in making a start toward the establishment of a trunk system. During the year 1918-1919 there were two sets of interconnected networks in the state, one in the northern, the other in the southern por-

tion. The control of each system was under the management of a power supervisor. As a result of this arrangement there was effected a saving of 300,000-bbl. in 1919, representing \$450,000. In the latter part of 1919 a connection of the northern system with the California-Oregon Power Company extended that network into the state of Oregon. Within recent weeks a connection between the lines of the Pacific Gas & Electric Company and those of the San Joaquin Company has tied the two networks into one and there is now a continuous trunk extending from the southern part of Oregon to the Mexican border. This is the most extensive network in the country today.

### Northwest Interconnections

When the final gap between the Washington Water Power Company and the Montana Power Company is closed, either by one of these companies, or by the Milwaukee, almost the entire Northwest will be interconnected.

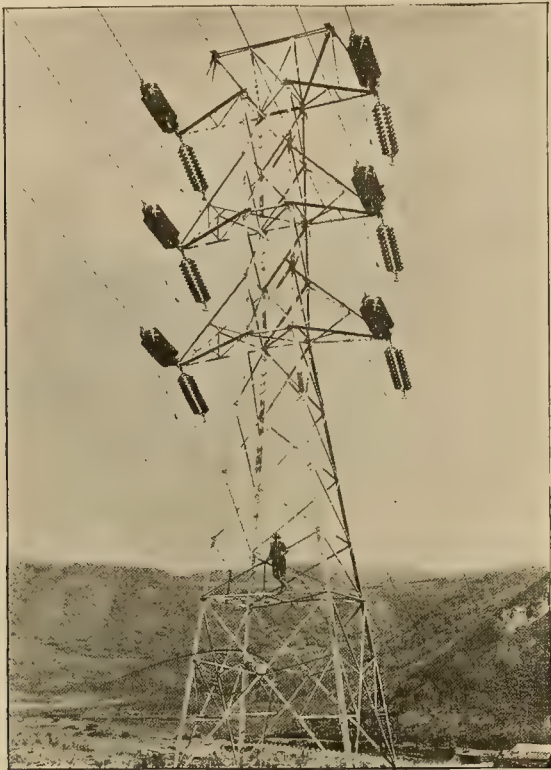
While it does not fall within the scope of this report to deal with this subject in detail, it is nevertheless proper at this point to call attention also to the recent paper by W. S. Murray and others in the March Journal of the Institute of Electrical Engineers on the economic supply of electric power for the industries and the railroads of the northeast Atlantic seaboard. This article deals with a so-called super-power zone and sets forth the results of some interesting economic studies of the power supply contemplated for this important section of the United States.

By treating all the power requirements of the territory as a whole and serving everything with one large trunk system there are enormous economic advantages to accrue both directly and indirectly.



Conclusion

The importance and magnitude of hydroelectric development as contemplated within the next few years should be clear to the most casual reader. In order that this development may be encouraged, it is the recommendation of this committee that due attention be given to the matter of favorable legislation, both Federal and State. In California, in particular, unsatisfactory state laws hinder the ready development of water powers which are assumed to be in conflict with



THE TRANSMISSION OF HYDROELECTRIC ENERGY

Grace terminal of 130-kv. transmission line, showing the heavy anchor tower and quadruple strain as used for long spans. The problem of high tension transmission is closely bound up with hydroelectric development in the west, where long distances must be traversed between the power developments in the mountains and the population centers.

other riparian rights on the stream. It should be the endeavor of this body and its members as individuals to remedy this and other unfavorable conditions which discourage investment. Important legislation is now before Congress, covering both the development of water power upon navigable streams and the broader question of water rights on government land. As urged elsewhere in this report, it seems advisable that a permanent committee be established by the National Electric Light Association to represent the interests of the electrical industry as a whole in the formulation of rules and regulations which shall govern the application of these measures.

It is further advocated that the policy of trunk line transmission, at 220,000 volts and over, be advanced as an economic possibility. We believe that all future activity in hydroelectric development the nation over should look toward unification and in a measure toward standardization of high voltage busbar installation. As particular instances, the early future should see giant power lines of 220,000 volts and upwards extending north and south through California and thence on upward to the Columbia and into the industrial center about Seattle, thence over the Cascades into Spokane, and Butte, Montana. It seems apparent that such systems will not only make feasible the most economic development, but will also do much to equalize the variations in rainfall to be expected from season to season, through the possibility of transferring power from one section where water is plentiful to another where a shortage obtains. This does not necessarily mean the actual transference of large blocks of power

over tremendous distances, but the shifting of load from one power system over into another and then on into another makes this possible without the actual long distance transmission of energy—a benefit which is already apparent in such interconnections as that between the California-Oregon and Pacific Gas & Electric systems.

Such a system of interconnection with superpower lines would also make possible the development of smaller powers along the line which could not otherwise be economically marketed and it would lay the foundation for supply of power for the electrification of steam railroads which popular demand is daily bringing nearer consummation.

The fact has been brought out in this report that \$710,510,000 is needed to finance hydroelectric construction for the next nine years in the West alone. The public must be brought to such a favorable attitude toward electric utilities that it will be prepared to furnish this money. How this may be brought about is a subject worthy of the earnest consideration of this body. It is obvious that the public is as closely concerned in the need for this development as the power companies themselves, and it seems logical that the benefits to each citizen need only be pointed out to him to gain his full interest and cooperation. The wide-spread education of the community should then be undertaken along the lines of the "self-interest" appeal.

It should further be pointed out that the success of this financing is likewise contingent upon a broadminded policy on the part of regulating commissions which must allow sufficient returns to the power companies so that the investor may see a possibility of fair return on his money. Indeed, it may safely be said that upon the adequate protection of the investor hinges the entire matter of power company financing. The function of a public utility commission has two aspects—the safeguarding of the interest of the public and at the same time a consideration of the welfare of the companies regulated to the extent that they are enabled to maintain a state of health and adequate growth. We cannot urge too forcefully the broadest spirit of co-operation between such regulating bodies, the electrical industry and the public, in order that the needs of the commonwealth may best be served.

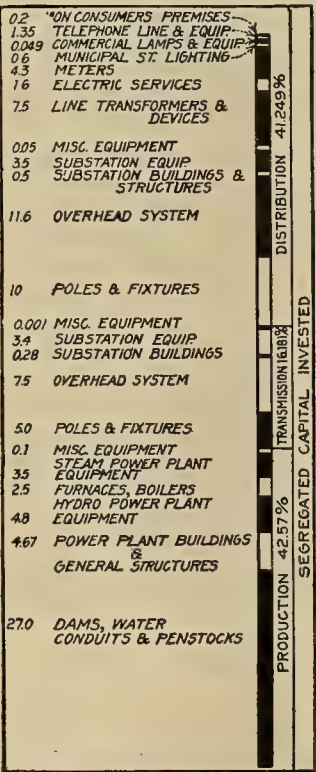


Fig. 9—Segregated investment of capital for electric power development.

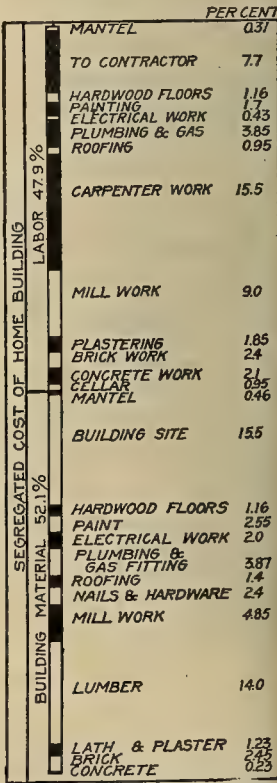


Fig. 10—Segregated costs of home building compiled from builders' records.



## APPENDIX "A"

**QUESTION:** "What, if any, influences are retarding the development of water powers in your state?"

## Answers

**Washington. (#47 D).** Referring to the portion of the state east of the Cascade Range, I should say that in general the reason why development has not proceeded to a greater extent than it has is because of the lack of market.

**(#56 D).** As far as the Pacific Northwest is concerned, I believe competition from municipalities and the present laws governing the development of water power and the acquisition of riparian rights for such developments within the forest reserve are the principal factors having influence towards retarding development of water powers.

**Oregon.** Lack of suitable Federal legislation permitting the development of water power on Federal reserves. Lack of public appreciation of the necessity of adequate revenues from operation to make investment attractive.

**California (#40 D).** The influences retarding the development of water power in the State of California are the influences that have retarded the development of water power in all public land states—briefly stated, the inertia of Congress, interference by hysterical conservationists, a lack of human intelligence and a lack of recognition not only of the rights of these public land states but the necessities of the people therein for production of power to encourage industries.

**(#44 D).** The established doctrine of riparian rights has had a great deal to do with retarding water power development in California. It has been for years recognized as a great misfortune that the law of riparian rights ever obtained a foothold in California, since it is wholly incompatible with the doctrine of prior appropriation which is applied in the public lands of the United States. No rights secured by appropriation can be enjoyed at the expense of the full measure of riparian rights vested in the owners of lands riparian to the lower reaches of the stream. It has been necessary for power companies in California to obtain consent to agreements with riparian owners in order to make development under the appropriation laws of the state and of the United States. While the use of water for power does not take it away from the riparian owner, it does, especially where there is storage, bring it to the riparian owner in different quantities and at other times than it would come in the course of nature, and he is entitled as a riparian owner to have the water flow exactly as it would in a state of nature, subject to reasonable use for domestic supply and for irrigation of riparian lands by other owners along the stream.

**Colorado (#21 D).** The development of water power in the state has been retarded by the refusal of capitalists to invest their money in developments which would be compelled to operate under the unattractive terms of a government permit.

**(#41 D).** Water power development in Colorado has been very much retarded and some large projects have been entirely blocked by the attitude of the general government. Most of the water power sites are on government land. Refusal of the Forestry Service to grant rights of way over public domain and refusal to issue anything but temporary indefinite permits, etc. Best water power sites are on public lands.

**Montana (#14 D).** The fact that the government of the United States has made large withdrawals of power sites along available rivers is a retarding influence and some law of Congress should be passed providing for the opening up of these undeveloped water power sites and the making of them available for use in operating both the Northern Pacific and the Great Northern railroads in the mountain regions.

**Nevada (#53 D).** No present demand for further development.  
**Utah (#52 D).** Failure by Congress to enact a water power bill is seriously retarding the development of water powers. Practically all of the undeveloped sites are upon the public domain withdrawn from entry, either as national forests, or as water power sites.

**Arkansas (#31 D).** Lack of demand for power is probably retarding the development more than anything else.

**Connecticut (#28 D).** The greatest influence retarding water power development in New England is the lack of co-operation among the various states. Most of our streams are interstate streams and the greatest requirements of our water power is increased storage in the headwaters, but because of the lack of co-operation between the various states the benefits of storage reservoirs created in one state and favorably affecting water powers in another state cannot be assessed upon those lower water powers because they are in a separate state from that in which the storage reservoir is located.

**District of Columbia (#16 D).** In our opinion it has not seemed feasible to develop any possible water powers in this vicinity due to the lack of continuous supply of water.

**Georgia (#32 D).** The influences retarding the development of water powers in this state are first, the difficulty and the cost of obtaining money for these purposes; second, the regulation of rates for power service supplied by the public utility company and the disposition to hold down utility rates to such a point as not to yield sufficient return on the capital required to induce investment of capital in the enterprises.

**Illinois (#57 D).** There are comparatively few water power sites of importance in Illinois. So far as these are located upon wholly non-navigable streams the state has no jurisdiction over them, and the private owners on either side of such a stream may make such use of the stream for water power purposes as they desire, subject, of course, to the riparian rights of owners above and below them. In this state title to the bed of a stream, whether it be navigable or non-navigable, is in adjoining owners, and not in the state. In the case of navigable streams the state has the right to prevent obstruction to navigation, and to control erections in the stream until such time as the Federal government takes control of such stream as a part of the navigable waters of the United States. The state authorities have made some efforts to declare by legislative act certain streams to be navigable which had previously not been so considered. One notable case of this sort has been in connection with an act passed in 1907 declaring the Desplaines and Illinois Rivers to be navigable. At that time the Economy Light and Power Company was engaged in constructing a dam for water power purposes across the Desplaines River at Dresden Heights below Lockport. The state instituted a litigation against the company, based upon this act, involving the de facto navigability of the stream. Later the Federal Government instituted a somewhat similar action. As a result of this litigation, work upon the dam was stopped and has not been resumed.

**Indiana (#17 D).** Nothing but economic conditions are retarding development of water power in this state. High cost of hydro development, cheap Indiana coal and lack of uniformity of flow of Indiana streams prevent economically the development of hydro possibilities.

**Iowa (#3 D).** None. Entirely an economic matter.

**(#25 D).** None, except high cost of land overflowed.

**Kansas (#51 D).** The smallness and uncertainty of the discharge and the cheapness of steam power are contributing factors in the discouragement of water power development in this state. The river (Verdigris River) is close to the coal mines and the center of a natural gas belt. It is believed that the influences which affect water power development in the Verdigris River in Kansas are representative of the state as a whole.

**Kentucky (#23 D).** Markets and money. Laws seem to be O. K.

**Maine.** See under Connecticut for New England states.

**Maryland (#22 D).** No influences except the high cost of development and the necessity of awaiting growth of the market have retarded development of additional power on the Susquehanna River.

**Massachusetts.** See answer under Connecticut for New England states.

**Minnesota (#19 D).** The majority of the rivers of this state available for water power development would be considered navigable streams and therefore would come under Federal control and until legislation is passed at Washington, no water power development of any consequence can take place in this state.

**Missouri.** No development of consequence to be expected.

**Nebraska (#15 D).** The retarding of the water power development in Nebraska is due to the shallow long streams and low heads being undesirable for development. There is much trouble caused by heavy snows and ice conditions at certain temperatures in the winter months which makes water power operation absolutely impossible.

**New Hampshire.** See answer under Connecticut for New England states.

**New York (#24 D).** The ratio between the developed and undeveloped power in this state is particularly low in view of the great industrial development throughout the state, within easy transmitting distance of very attractive power sites. The reason for this is partly because a considerable portion of the undeveloped power is on the Niagara and St. Lawrence River, ownership of which is disputed by the state and Federal Governments, and development of which is at present limited by international treaty.

The development of power on streams which are neither interstate nor international boundaries has been hindered by the lack of suitable legislation to make such development possible. There are two factions in the New York State Legislature, one of which is committed to out and out state ownership of all water power in the state, the other favoring private ownership with state regulation. Although bills have been introduced in the Legislature at nearly every session during the last twenty years neither party has had sufficient majority over the other to succeed in enacting any constructive legislation which would definitely start development on either basis. What development there is has been effected entirely on private initiative by the process of buying riparian rights, one at a time, and at the seller's price.

**(#45 D).** (A) The larger portion of the undeveloped power from streams within the state is in, or connected with, the State Forest Reserves, which cannot be entered for practical purposes, either by state or by private interests without a change in the constitution of the state.

(B) Generally speaking, the economical development of the rest of the power possibilities on streams within the state cannot be carried out without regulation of flow by reservoirs, to acquire lands for which will require the right of condemnation. It is held by many that such right cannot be given for water power purposes under the present state constitution.

(C) The bulk of the undeveloped power, about 2,000,000-hp. is on the international boundary streams, namely the Niagara and St. Lawrence Rivers, control over which is assumed by the Federal Government. Development of Niagara power is restricted by an international treaty limiting the diversion of water from the Niagara River to 20,000 cu. ft. per second, all of which is now utilized. The development of both the Niagara and the St. Lawrence Rivers is retarded by international questions and by the lack of definite water power policy on the part of the state and national governments.

**Ohio.** Very little water power development to be expected.

**Pennsylvania (#39 D).** Influences retarding hydro development in this state are cheap fuel, the extremely wide range of runoff, generally low available heads of streams located in the main in a broken country where large amounts of impoundage are difficult to arrange.

**Vermont.** See answer under Connecticut for New England states.

**Wisconsin (#43 D).** We do not feel that there are any influences retarding the development of water power in this state.

**QUESTION:** "What, if any, legislation should be enacted to make available for development the water powers of your state?"

## Answers

**Washington (#47 E).** The only important legislation so far as I know which is lacking at the present time would probably be covered by the passage of the so-called Water Power Bill now pending before Congress.

**Oregon.** Passage of the water power bill now pending before Congress or similar measure is needed for future power development in this state.

**California (#40 E).** My personal view is that the legislation that should be enacted to make available for development water powers in this state would be legislation that would turn over free of any restrictions or taxation the land belonging to the government necessary for any water power development and leave it to the best qualified agency to develop. And this is, of course, an impossible thing to do under present circumstances, we should accept the best legislation we can obtain from Congress that will make it the easiest to secure capital for these developments.

**(#42 E).** It is our belief that certain legislation should be passed offering a large measure of protection to the investors in public utilities and principally it should be beyond the power of any regulatory body to so limit the earnings of utilities that it cannot finance for the future needs of its territory. We have ourselves suffered acutely from a revision of rates which permitted us to earn a reasonable return only under the most favorable conditions of rainfall, material and labor costs, and money supply, and when a combination of two dry years, ascending prices and high interest rates struck us in conjunction, it rendered us entirely helpless, and we are only now seeing a change of opinion on the part of the regulatory commission of this state which has been largely brought about by an appalling condition for which they must be in a great measure held responsible. The policy of basing rates upon a combination of most favorable conditions, ignoring the well known hazards under which such utilities operate, will always produce periods running from embarrassment to disaster in which not only utilities suffer but their consumers and their territory likewise.

It is our view that the investing public would also be reassured if the rate fixing body were relieved of its function of "representing the people"; there is a serious inconsistency when judge and prosecutor are merged in the same identity and the state of California might well follow in the lead of certain of the great eastern states and separate these two functions of rate control. The regulatory and rate making body should be strictly judicial in its character and the tenure of office of its members should be so lengthened that they would not be quickly responsive to such manifestations of popular will as sometimes cry out for a virtual confiscation of business.

It should be said in closing, however, that the California Railroad Commission has lately shown a very hearty appreciation of the needs of the utilities and while the lesson has been expensively bought both by the companies and the public, it will likely be remembered for some time, and we are glad to say that at this time we are having co-operation and support to a very high degree, in fact, it seems as though the public, or certainly the more thoughtful portion thereof, have gotten different viewpoints lately and realize how largely their own interests are identical



with such utilities as ourselves, and such criticisms as may be inferred from our remarks are, as far as California is concerned, largely directed to a past condition.

(#44 E). The doctrine of riparian rights is protected by the constitution and cannot be abolished by the Legislature. Eventually foot-hill reservoirs must be provided on all the large power streams which will receive waters after use for power purposes, and which will serve to regulate the flow of the stream so as to approach its natural flow, if insisted upon by riparian owners or so as to best serve the interests of irrigators. These regulating reservoirs are necessary to adjust the friction which now exists between the power interests and the irrigation interests of California.

The municipal ownership provision of the Water Commission Act which has already been referred to, is perhaps a deterring influence. A title to water power based upon the Act, subject to municipal appropriation at the end of twenty years is not a very satisfactory one to use as security to obtain the necessary financing. It would be desirable to have the period made the same as that contained in the present regulations of the Forest Department of the United States, and in the new Water Power Bill now before Congress.

Colorado (#21 E). Our government must be prepared to grant permits under terms satisfactory to capitalists and above all irrevocable.

(#41 E). I have no suggestions to make relative to legislation for encouragement of water power development, except for the government to remove or at least vary materially modify their restrictions. These restrictions, as I understand it, were made in response to the general demand over the nation for the conservation of their natural resources and for the restriction of monopoly. I do not fear any great monopolization of the water powers of our state for the reason that the most of it is in the mountain region and is divided into small units. Cities and towns, mining companies, and even small farming communities can readily develop individual units for their own private use. Then we have a Public Utilities Commission which can regulate prices where electricity is sold to the public.

Montana (#14 E). An Act of Congress providing for the opening up of numerous undeveloped water power sites under Federal control would aid to a large extent in making available the water powers upon the Clark's Fork of the Columbia River in Missoula and Flathead Counties.

Nevada (#53 E). None.

Utah (#52 E). When the water power bill has become a law we are of the opinion that no other legislation will be required.

Arkansas (#31 E). The laws of the state should be amended repealing that portion which requires companies to pay to the state a percentage of gross revenues.

Connecticut (#28 E). Legislation should be passed in certain of the New England states providing for the co-operation between states and the establishment of storage reservoirs on interstate streams. There is very little, if any, co-operation between the states at present and these streams cannot be developed to their full possibility until such time as such co-operation is established between these states.

District of Columbia (#16 E). We do not think any legislation should be enacted looking toward the expenditure of large sums of money to develop any of the water power possibilities within this vicinity.

Georgia (#32 E). The legislation needed in this state is to authorize companies to change their rates whenever their conditions justify, either upward or downward and the rates to go into effect subject to review by the State Railroad Commission on complaint. Then a disposition upon the part of the public and the authorities to permit rates sufficient to attract the necessary capital into the enterprise.

Illinois (#57 E). We do not believe that any additional legislation is necessary to make the limited number of water power sites under public control available for development.

Indiana (#17 E). Financial state aid for the construction of the dam, head-race and tail-race. The other parts of the hydro development could be sustained by private enterprises, but the cost of overflow privileges, the cost of the dam and the cost of the canal for private money is too much to permit of private development.

Iowa (#3 E). None.

(#25 E). Cannot answer.

Kansas (#51 E). Before legislation is to make available the greater use of water power in Kansas it will be necessary for the state to investigate water power more carefully and make a complete inventory of the present water power development. The Legislature of 1917 passed a Water Commission Act, which is the foundation upon which such an investigation may be made.

Kentucky (#23 E). I know of no legislation that should be enacted to make available for development the water powers of Kentucky.

Maine. See answer under Connecticut for New England states.

Maryland (#22 E). No legislation required.

Massachusetts. See answer under Connecticut for New England states.

Minnesota (#19 E). The enactment of proper legislation at Washington will do much to solve the problem. I am not prepared to state what local legislation would, at the present time, be beneficial.

New Hampshire. See answer under Connecticut for the New England states.

New York (#24 E). Legislation which should be enacted to make available the water powers of New York is a matter of too controversial a character to be set down here as anything other than a matter of personal opinion. The writer believes, however, that his own opinion is shared unanimously by those whose familiarity with the technical and commercial features of the hydroelectric power business makes their sentiments anything more than a matter of party politics. This opinion is that all public utility companies, being subject to the Public Service Commission of the state in matters of rates, capitalization, franchise territory, etc., should have the right of eminent domain over private owners of riparian rights at undeveloped power sites, and that this right should not be taxed by either the state or by any municipality, inasmuch as the rates for power are subject to state regulation by the Public Service Commission.

(#45 E). The development of water power from streams within the state would be stimulated by constitutional amendment and laws permitting the condemnation of lands for reservoir and other power purposes. The development of power from the Niagara and St. Lawrence Rivers would be helped by the passing of the Water Power Bill now before Congress, by an amendment of present restrictions limiting diversion from the Niagara River and by agreements between the governments of Great Britain and the United States.

Pennsylvania (#39 E). The legislation needed to encourage hydraulic development in this state is eminent domain for high tension transmission lines.

(55 E). There should be an amendment to the Act of July 2, 1895, adding to the powers granted under that Act the power to appropriate property necessary for transmission and distribution lines, compensation with security therefore to be provided for in the usual manner for the taking of property and should not give any power to take any natural resources or to take property for stations or other similar facilities and should further provide for a finding by the Public Service Commission that service to be rendered with the lines to be so built as necessary for the public's accommodation.

Rhode Island. See answer under Connecticut for the New England states.

Vermont. See answer under Connecticut for New England states.

Wisconsin (#43 E). We do not feel that there are any influences retarding the development of water power in this state. Therefore, we cannot suggest any legislation which would make water power development easier.

QUESTION—(A) "Would the development of such undeveloped water powers in your state offer any economies over the continued production of power by steam? (B) Could such water power, if developed in your state, successfully compete with power produced by coal?"

#### ANSWERS

Washington (#47 F). (A) It is probable that there would offer such economies as compared with the production of power by steam, provided the load factor of the consuming agencies was sufficiently high. (B) Such developments could probably compete successfully with power produced by steam provided the load factor is sufficiently high.

(#56 F). In answering this question I wish to point out first that there is very little production of power with steam outside of the lumber industry where wood refuse is used for fuel. Some of the utility companies have steam standby plants, and steam also to make up for water deficiency at certain times of the year but there is no extensive production of prime power by steam in the state. The question then resolves itself into one as to whether future power developments will be by water or by steam, and the answer will depend almost entirely on the extent to which the market for power develops and where it develops.

Practically all of the undeveloped water power is within feasible transmission distance of either Spokane or Seattle and the very considerable amount of undeveloped power on the Columbia River and some of its tributaries could be economically delivered to either city, providing the market grows to such an extent that a relatively large amount of power could be quickly absorbed when a new water power development was produced. To illustrate, to develop 200,000-hp. at Priest Rapids on the Columbia River would not in the present state of the market, be feasible and if the Priest Rapids site were the only one available in the state it would possibly be more economical to take care of increases of load by means of steam installations which would perhaps eventually be displaced by the development of Priest Rapids site, a contingency that would perhaps eventually be displaced by the development of Priest Rapids site, a contingency that would, however, involve the amortization of the investment in steam plants and might therefore be deferred for a long time. Assuming, however, the healthy growth of agricultural and industrial interests throughout the state, I believe that it is safe to say that their demands can be economically met by the development of the small powers first, and that eventually most or all the water power of the state would be used.

Oregon. Yes, there are a number of undeveloped water powers in this state which could compete successfully with steam.

California (#40 F). (A) Even at the present high price of labor and material water powers of this state undeveloped would, when developed, offer economies over the continued production of power by steam in a ratio of 1 to 2. (B) Yes. The production of oil has not kept pace with the increased demand and the price of approximately \$1.56 per bbl. is almost 300 per cent of what it was three or four years ago.

(#44 F). I am not sufficiently familiar with conditions governing water powers available to answer with a satisfactory degree of precision. With regard to the undeveloped water powers controlled by Southern California Edison Company, I would state that the development of the part of the state served by this company cannot continue without these additional supplies of power. All additional agricultural and industrial development of the state must arise from the development and distribution of electric power. The companies now supplying fuel oil question their ability to provide sufficient supplies of oil for the present power requirements, and therefore water power must be brought in if the development of the state is to continue: The undeveloped water power projects controlled by the Edison Company can be constructed to produce power very much cheaper than would be possible through the medium of either coal or oil as fuel at the present market prices, and we anticipate an increase in these prices in the future, the price of oil having increased from 60 cents to \$1.85 per bbl.

Colorado (#41 F). I believe in many places in the state power can be developed by water cheaper than by coal, even though we have an abundance of coal in Colorado and in many places in order to get a large volume of continuous power for twelve months in the year large storage reservoirs would have to be built. There are very few water power sites of any size that have not been largely developed. This means that any excessive future development would probably involve the use of induction generators and semi-automatic turbines with a great deal of transmission lines in exceedingly rugged country.

Montana (#14 F). The development of the water power on the Clark's Fork of the Columbia River in Missoula and Flathead counties should result in the operation of two transcontinental lines by electricity rather than by steam and would successfully compete with power produced by coal. As a matter of fact, it is now stated that without the aid of the electric power in the operation of the mines at Butte, that such mines could not be operated at any considerable profit.

Nevada (#53 F). Only one large steam power plant in the state and water power is not available to compete with same.

Utah (#52 F). Aside from the use of coal in locomotives there is very little steam power used in Utah at present, since the cost of steam power is in excess of rates for water power.

Arkansas (#31 F). Do not believe at this time or until the demand for power becomes greater that any economies would be effected over the development of power generated by coal as fuel.

Connecticut (#28 F). The increased cost of coal has made commercially feasible the development of many small water powers which under the old basis of coal costs would not have been profitable. With a return to more normal building cost it is expected that there will be a good deal of hydroelectric development in the New England states, as many small water powers can now be developed at a profit.

District of Columbia (#16 F). We do not feel that any possible water power development would prove as satisfactory as the production of power by steam.

Georgia (#32 F). Water power in this state can successfully compete with power produced by coal. In fact, it is already being supplied to manufacturing industries at much less than it could be produced by coal and is displacing steam power plants wherever the water power is available.

Illinois (#57 F). The development of undeveloped water powers of Illinois offer economies over the continued production of power by steam because the cost of coal, transportation and labor have increased so greatly during the last few years. Further as the country's coal supply is being rapidly depleted, any future developments of water power which would save on the coal supply would be an economic asset to the country. Water power as developed at present in Illinois is successfully competing with power produced by coal.

(Continued on page 535)



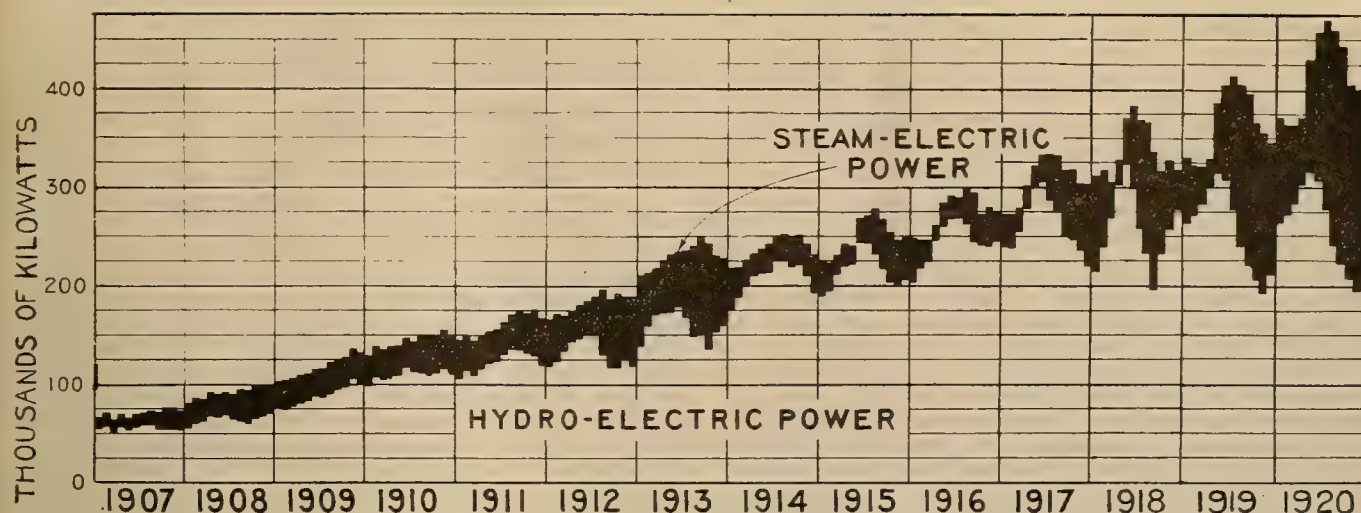


Chart of the mean monthly loads on California hydroelectric systems, showing the hydroelectric power produced and the production of steam plants. The increase of output during the summer months is due mainly to the increased use of power for irrigation pumping.

## The Electric Power Situation in California

BY LESTER S. READY

(The power situation in California, where the irrigation load is increasing with such phenomenal rapidity, is making demands upon the electrical industry which necessitate hydroelectric developments and interconnections on an unprecedented scale. The following interesting survey of conditions is by the assistant chief engineer of the California State Railroad Commission.—The Editor.)

The most important problem now facing the electric utilities of California is that of supplying the growing demand for power being made upon their systems. The demands of consumers being served exceed the present supply and there appears to be a greater and more insistent demand for new service than ever before in the history of the state. This is due to many causes, including greater industrial activity, enlargement of agricultural acreage, greater use of electrical appliances and the increased cost of fuels used in the production of power. California has much undeveloped hydroelectric power, which is the logical source of supply to meet these increasing needs.

### Consolidation of Utilities

The past years have seen a continuous process of consolidation of the electric utilities and interconnection of systems. Notable instances of this have been the merger of Pacific Light & Power Corporation, Ventura County Power Company and now the Mt. Whitney Power & Electric Company into the general system of the Southern California Edison Company; the absorption of several small companies into the Southern Sierras Power Company, and the consolidation with the Pacific Gas & Electric Company of the Oro Electric Company, Northern California Power Corporation and Sierras & San Francisco Power Company. Interconnection of systems has been completed to the extent that at the present time, from an operating standpoint, there are really only two systems serving California. The northern system extends from the Oregon line to Newman and King City, and consists of California-Oregon Power Company, Pacific Gas & Electric Company, Great Western Power Company and Western States Gas & Electric Company and certain smaller utilities.

The southern system extends from Merced and Paso Robles south to the Mexican border and east to Nevada and consists of San Joaquin Light & Power Corporation, Southern California Edison Company, City of Los Angeles, Southern Sierras Power Company, San Diego Consolidated Gas & Electric Company and Los Angeles Gas & Electric Corporation. Before the convention of the National Electric Light Association meets at Pasadena on May 18th, 1920, these two vast systems will have been connected by a 60,000-volt transmission line south from Newman. When this is completed the electric utilities from the Oregon line to the Mexican border will practically be working in synchronism, joining in the service of the state across a distance of over 800 miles this vast system of 75 hydroelectric plants with an installed capacity of 470,000 kilowatts, 47 steam plants with a total capacity of 315,000 kilowatts, interconnected through 7,200 miles of high tension transmission circuits and serving a total of approximately 600,000 consumers.

This interconnection is of relatively small capacity. Within the near future sufficiently large capacity may be had to utilize any diversity of supply or demand. With this accomplished the electric power industries of the entire state may be considered as one great system.

### Rapidity of Development

The growth of the electrical industry in California has been steady, increasing somewhat more rapidly during the last three years than formerly and giving prospects of increasing during the coming decade still more rapidly. An indication of this growth may be had from Chart No. 1, which shows for the electric utilities of the state the average



monthly kilowatt load as it has occurred since 1907 to and including 1919, with estimates for the year 1920. This chart, which is based on that prepared by Mr. F. H. Fowler of the United States Forestry Service, shows the trend of the electrical business for the past 14 years. The amount of hydroelectric power produced and the production of steam power plants is set forth. It is to be noted that during the latter years the output has materially increased during the summer months. This has been due primarily to the rapid increase in the use of power for irrigation pumping. This service is growing to be the dominant load on all of the combined systems. As shown by the curve, the production of power by steam reached a maximum in 1913, a year of short rainfall, which was followed by the completion of two large hydroelectric developments, one being that of the Pacific Light & Power Corporation on Big Creek, Fresno county, and the other the installation of the Drum Power Plant of Pacific Gas & Electric Company. A second marked increase in steam production commenced in 1917 and has extended through to the present year. This is a result of the reduction in hydroelectric output due to a series of dry years, the practical cessation of power development during the war period of 1917-18, and the delay in completion of new developments commenced thereafter. The total power output during the year 1915 to and including an estimate of 1920 has been as follows:

ELECTRIC OUTPUT CALIFORNIA ELECTRIC UTILITIES				
Year	Hydro Output M. Kw-hr.	Steam Output M. Kw-hr.	Total M. Kw-hr.	% Increase
1915 .....	1,857,700	378,800	2,236,500	
1916 .....	1,995,200	351,100	2,346,300	5%
1917 .....	2,097,500	485,000	2,583,000	10%
1918 .....	2,162,300	728,500	2,890,800	12%
1919 .....	2,246,900	966,300	3,213,200	11%
1920 .....	2,222,700*	1,394,000*	3,616,700*	12%*

\*Estimated

The percentage of total production by steam will, as noted, reach a maximum in 1920 of approximately 38% as against an average during normal conditions of from 15 to 20½.

#### Increase in Demand

The growth of load has so exceeded the increase in plant development during the past three years that the utilities will not be able to meet the demands made upon them by existing consumers and have found it necessary to discourage and practically refuse new business. A general analysis of the conditions show that the state is at least 25,000 kilowatts short of the minimum plant capacity needed. Even with the operation of all steam plants available, regardless of efficiency or cost, curtailment of use equal to approximately 10% of the load will be necessary in the northern district. In addition to this actual shortage of plant capacity and output, the electric utilities are at the present time at least 100,000 kilowatts short of the most economical hydroelectric capacity in view of present load conditions and relative cost of steam power. The plans for the coming years must include, in addition to meeting the actual growth of demands, the further installation of this additional hydroelectric capacity.

The average growth in the demand for power prior to 1918 was at the rate of approximately 200,-

000,000 kilowatt-hours per year. The growth during the years 1918 and 1919 increased to in excess of 300,000,000 kilowatt-hours per year, and it is estimated for 1920, if the full demand can be met, that the use of power will increase approximately 400,-000,000 kilowatt-hours over the year 1919.

The average increase for the past four years has been at the rate of 11% per annum, and the special conditions tending to further increase this use of power at this time, which has resulted in unprecedented requests for service, it may well be expected that the business of the electric utilities of California during the next five years will increase at the rate of at least 12% per annum. On this basis, the years 1920 to 1925 inclusive may be expected to see a growth in the requirements of the utilities of California amounting to a total increase of approximately 75 per cent.

From a study of the power loads of the two great systems now serving the state it appears that the load factor of the combined systems when fully interconnected will be between 60 and 65 per cent. No material increase in the load factor is to be contemplated under normal conditions of operation and the new business to be taken on may be expected to be at a load factor not in excess of 65 per cent. The growth of load of approximately 12% per annum will result in a further increase in the simultaneous demand of from 65,000 kilowatts to 85,000 kilowatts per year.

#### Increasing Plant Capacity

It has been found necessary, due to variation of precipitation from year to year, to increase plant capacity to a greater extent than the increase of simultaneous demand. At present this ratio of capacity to demand is approximately one and one-quarter and this figure has been found to represent practically the minimum.

During the next five years the electric utilities in California must contemplate an increase in the plant capacity of from 80,000 kilowatts to 100,000 kilowatts per year in order to meet the growth in load. In addition, the next five years should see the increasing of the relative capacity of hydroelectric power by at least 100,000 kilowatts to reduce the present excessive steam production, bringing the total to 500,000 kilowatts or a minimum per year of 100,000 kilowatts.

There is at present invested in physical plant and system of the electric utilities of California approximately \$240,000,000, covering the installation from the diversion of water in the mountains to the consumers' meters, and representing a total investment of approximately \$400 per kilowatt of simultaneous peak. The cost of construction of electric power plants, transmission and distribution systems is now from 50 to 100 per cent higher than when existing systems were installed, and, if it be assumed that these higher costs continue for the next five years without any further increase, the utilities of California must be prepared to expend on new developments and in extension of their existing systems between \$40,000,000 and \$50,000,000 per annum.



The work before the electric utilities is no small task, especially in view of the high cost of money and difficulty of obtaining sufficient funds. The present year will, however, see the completion of 90,000 kilowatts of hydro plant capacity and 25,000 kilowatts of steam. The year 1921 should see at least an equal amount added.

The past three years of drought have made clear to those affected the importance of the storage of water for irrigation and power purposes. There has been a large increase in the acreage depending upon irrigation for the production of crops and the effect of the short precipitation upon the operation of power plants has been such as to clearly set forth the need of additional storage in connection with those plants. The coming few years will in all probability see increased activity in the development of storage for irrigation purposes.

Practically all streams on which power may be developed are being used to their limit for irrigation purposes. Cooperation between the power and irri-

gation interests should result in material benefit to both and make more completely available the most valuable natural resource of the state.

The development of power requiring such large expenditures must be carried on with determination and special care as to cost. Comprehensive studies of their needs must be made by the utilities and plans worked out for the most economical developments in order that the best may be had. The more economical developments should be made regardless of control or ownership. Through the state agencies regulating the electric and water service, complete and comprehensive studies of the water and power possibilities of the various streams should be made and developments so co-ordinated that the greatest good may be obtained for the state through the more complete use of its natural resources. Petty differences between utilities must be buried, business jealousies forgotten, and every effort exerted to the end that the extension of service may be made on a sound basis and with the least total cost to the public.

## Electrical Development in the San Joaquin Valley

BY A. G. WISHON

(That the West progresses in the same proportion as its hydroelectric development is a principle which is fully substantiated by conditions in the San Joaquin Valley. To meet the tremendous demand for power which is coming in from this district, extensive hydroelectric developments and improvements are going rapidly ahead. The following account is by the general manager of the San Joaquin Light & Power Corporation.—The Editor.)

Located in the heart of the San Joaquin Valley, one of the wealthiest agricultural regions in the West, the San Joaquin Light & Power Corporation serves a territory that is entirely dependent upon the development of electricity for its growth and prosperity. At the present time, the power company's statisticians figure that the agricultural and electrical possibilities of the San Joaquin Valley are less than 10% developed.

With the end of the war the San Joaquin Light & Power Corporation had a maximum generating capacity of 63,000 kw., from nine hydroelectric plants and three steam plants. About the first of June of the present year a new 12,500-kw. addition to the natural gas burning steam plant at Bakersfield will be placed in operation. By the middle of September the new 30,000-kw. Kerckhoff hydroelectric plant on the San Joaquin river, forty-five miles from Fresno, will be in operation.

Preliminary work has been started on the new natural gas burning steam plant to be erected in proximity to the recently discovered natural gas fields near the Elk Hills in the west side oil fields of Kern county. The company plans the installation as rapidly as possible of at least four 15,000-kw. units, and if the supply of natural gas is sufficient to warrant additional or larger installations, the company plans to include these provisions. All materials and equipment for the first unit have been ordered and the company is making a determined effort to place the plant in operation before the end of 1920. While undoubtedly the plant will be operating before the end of this year, it will probably come too late to be

of material assistance in handling the power shortage during the forthcoming agricultural pumping season. Nevertheless, it will be a plant of strategic importance, and the fact that it will generate power by means of burning natural gas, at greatly reduced cost as compared with crude oil fuel, this plant promises to play an important part in the interchange of power between the different power companies of the state, under the jurisdiction of the State Power Administrator and the Railroad Commission, resulting from the interconnection of the different transmission systems.

Therefore, the building program of the San Joaquin Light & Power Corporation will place in actual operation in the year 1920 new power houses with a combined output almost equal to the total generating capacity of the company at the beginning of the year.

### Kings River

The big hydroelectric development of the San Joaquin Light & Power Corporation is the Kings River project, the lower power house of which will be less than thirty miles from the center of the company's transmission and distribution system. This project will have an ultimate output of between 270,000 and 300,000 hp. The estimate of its ultimate cost is between \$50,000,000 and \$55,000,000. All preliminary engineering has been completed. More than thirty miles of the fifty miles of roadway necessary to open up the country have been completed and two bridges over the river are installed. The company's original plans provided for prosecution of the Kings River job in 1921 and for the completion of the first unit at the end of that year.





1 CRANE VALLEY LAKE

2 No. 2 POWER HOUSE

3 CRANE VALLEY DAM AND POWER HOUSE

4 CONCRETE CONDUIT & TUNNEL

5 No. 3 POWER HOUSE

6 STEEL FLUME CONDUIT

7 SAN JOAQUIN POWER HOUSE

8 INTERIOR SAN JOAQUIN POWER HOUSE

9 PUMPING FROM SAN JOAQUIN RIVER

10 OIL WELL PUMPING

11 MOTOR PUMPING OIL WELL

12 AGRICULTURAL PUMPING PLANT

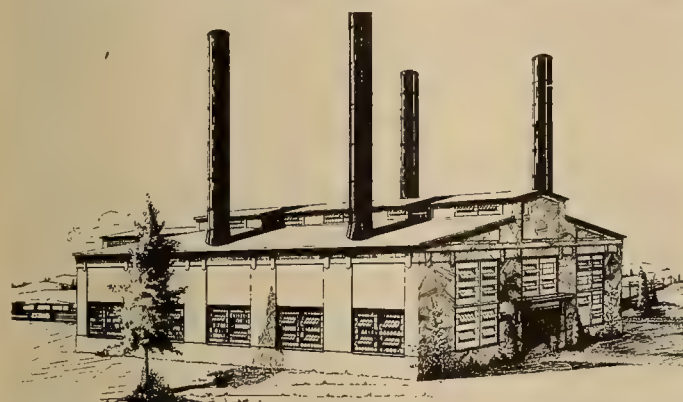


In view of the shortage of power and the opportunity to develop a supply by means of the natural gas discovery in the Kern county oil fields by the erection of a steam plant more speedily than by the

Reservoir	Location
Lake Wishon	N. Fork Kings River, Coolidge and Dusy Meadows
Meyer Lake	Deer Creek at Buck Meadows
Peart Lake	N. Fork Kings River, Dinkey Meadows

development of a hydroelectric project, the company diverted the finances intended for the first unit of the Kings River development to the Oil Fields steam plant, in order to meet the increasing demand for more power as speedily as possible.

The Kings River development will be located on the North Fork of Kings River in the Sierra National



Sketch of the new Oil Fields steam plant of San Joaquin Light & Power Corporation. The first installation will be a 15,000-kw. turbine, and the plant will feed into the 110,000-volt transmission system at the McKittrick sub-station.

Forest, in Fresno county. It will have a total reservoir storage of 202,200 acre feet and a power capacity of 271,250 hp. The storage is embraced in three reservoirs, as shown in the table above.

The power will be derived from seven plants, located as follows: Wishon, on the North Fork of Kings River at the Coolidge and Dusy Meadows; Haas on the North Fork of Kings River; Peart on the North Fork of Kings River at Dinkey Meadows; Meyer, in the Deer Creek Basin; Farnham, on the west branch of the North Fork of King's River; Kings River, on the main Kings river at the head of the proposed Pine Flat Reservoir. The major power house of Balch, which has 45% of the total power capacity of the development, is located 54 miles, by highway, easterly of Fresno at the junction of the North Fork of the Kings river and the west branch of the North Fork of Kings river, and is the geographical hub of the entire development.

This development will have, so far as is known, the two highest heads in the United States and with few exceptions, in the world. Balch Power House, with a head in excess of 2500 feet, will be the highest, with Haas next with 2475 feet. Wishon will

have a head of 235 feet and the Kings River a head of 410 feet, making the total head of these four power houses on the North Fork of Kings River 5,620 feet, in a distance, as the crow flies, of six

Elevation Above Sea Level	Capacity Acre Feet	Drainage Area Square Miles	Height	Dam Top Length
6,550 ft.	128,000	178	250 ft.	4,100 ft.
6,850 ft.	21,000	19	190 ft.	1,600 ft.
5,650 ft.	53,200	65	315 ft.	900 ft.

and one-half miles. The power houses are listed in the table at the bottom of the page.

### Crane Valley

Additional developments, or refinements, in the Crane Valley district are to be begun this year. The first of these will be the installation of a 9,000-hp. automatic plant to be known as Kerckhoff Jr. Power House, 400 feet below the recently completed Kerckhoff Dam. This plant will utilize the overflow over Kerckhoff Dam, under an 80-ft. head, during the periods of high stream flow of the San Joaquin river. It will be in operation approximately five and one-half months of the year and will increase the efficiency of the company's plants on the San Joaquin river by taking advantage of run-off that otherwise would go to waste. Efforts were made to install this plant during the spring of the present year, but it was impossible to obtain deliveries of equipment. This plant will in all probability deliver its output into the 60,000-volt transmission system.

The raising of Crane Valley dam 12 feet to provide 17,000 acre feet of additional storage capacity,



The Kerckhoff dam on the San Joaquin river near Fresno, showing intake of 17½ x 17½ tunnel line, incline and camp.

Power House	Capacity	Elevation Above Sea Level	Head	Diversion	Tunnel Length	Section	Penstock
Wishon	6,670 hp.	6,315 ft.	235 ft.	400 sec. ft.			700 ft.
Haas	82,670 hp.	3,825 ft.	2,475 ft.	400 sec. ft.	7.4 mi.	12 ft.	7,000 ft.
Balch	124,000 hp.	1,310 ft.	2,500 ft.	400 sec. ft.	5 mi.	12 ft.	
Peart	2,600 hp.	5,385 ft.	265 ft.	200 sec. ft.	4.1 mi.	9x7½ ft.	6,550 ft.
Meyer	6,670 hp.	5,385 ft.	1,465 ft.	150 sec. ft.			300 ft.
Farnham	26,670 hp.	3,825 ft.	1,545 ft.	50 sec. ft.	1.1 mi.	6 ft.	2,400 ft.
				150 sec. ft.	4.3 mi.	7½ ft.	
				50 sec. ft.	1.6 mi.	9x7½ ft.	4,600 ft.
Kings River	22,670 hp.	890 ft.	410 ft.	650 sec. ft.	3.7 mi.	14 ft.	950 ft.



at a cost of more than \$1,000,000, is the second step in the program. Brown's Creek Ditch will be built, diverting 14 square miles of watershed into Crane Valley as a part of this improvement.

The output of No. 3 Power House will be increased by the installation of an additional 2,000-kw. unit and the enlargement and cementing of the No. 3 ditch to increase its carrying capacity from 100 second feet to 160 second feet.

#### Other Plant Improvements

The output of Tule River Power House will be increased to maximum capacity by the completion of the Nelson Branch conduit. This will give approximately 3,000 additional kilowatts, practically doubling the output of the power house. All engineering for this work has been completed and the construction work is one of the early sections of the 1921 building program.

Re-building of the Kern River plant so as to utilize a larger amount of water by the extension and enlarging of the conduit system which will provide a higher head, has been provided for at the first time the company is enabled to do without the output of the present 3,750-kw. unit now in operation. The plant will be increased to 12,500 kw. at an expense of between \$2,500,000 and \$3,000,000, but the work must necessarily be postponed until the construction program catches up to the demand. The present unit, which will be replaced by one almost four times as large, will be moved to another part of the company's system for installation.

The company is at present negotiating for the leasing of the plant serving Mariposa, Mt. Bullion and Bear Valleys in Mariposa county. By the construction of four miles of line between the Kittridge Power House and the plant of the Mariposa Company at Bagby a very good prospective territory will be added to the mining load of the company.

#### 110,000-Volt Transmission Lines

With the completion of the Kerckhoff Power Plant, the inauguration of 110,000-volt transmission service will be begun by the company between the Kerckhoff plant and the McKittrick sub-station where distribution is made for the west side oil fields of Kern county. This new high tension transmission line will have a carrying capacity of 50,000 kilowatts. It is being erected on steel cross-arms on 60-ft. wooden poles. The aluminum wires are  $\frac{5}{8}$ -inch in diameter.

There are three-sub-stations, stepping the voltage down from 110,000 volts to 70,000 volts. The first of these sub-stations is located close to Sanger. The second sub-station is located at Corcoran and the third at McKittrick. At each sub-station there is installed a bank of four 5000-kw. transformers which reduces the voltage from 110,000 to 70,000 and also 11,000, so that distribution can be made at 11,000 volts. At each sub-station site there will be a concrete sub-station for the housing of the switches, metering equipment, etc., and a cottage for the attendant. The total expenditure on the line and sub-stations will amount to about \$750,000.

Additional 110,000-volt transmission service is planned from the Kerckhoff plant through the Northern division of the company's territory, ultimately tying in with the Pacific Gas & Electric Company at Modesto. Unless prospects for an additional supply of natural gas in the Santa Maria oil fields materialize sufficiently to warrant the company to increase the size of its steam plant now being operated at Betteravia near Santa Maria, the 110,000-volt transmission line will be extended from the McKittrick sub-station into the Santa Maria oil fields. This territory is on the system of the Midland Counties Public Service Corporation which purchases power wholesale from the San Joaquin Light & Power Corporation. The Midland serves a territory of great potential wealth and offers a market for much service just as soon as additional generating facilities can be provided.

#### Steam Plants

In order to transport the additional supply of natural gas required by the new unit in the Bakersfield steam plant the Midway Gas Company is laying approximately 50 miles of 12-inch line from the Elk Hills to Bakersfield which will have a daily carrying capacity of approximately 25,000,000 cubic feet. At the present time the Bakersfield steam plant is using the 6,000,000 cubic feet capacity of a 6-inch line which was laid a distance of 26 miles last summer, connecting up with the Midway Gas Company line between Kern county oil fields and Los Angeles 26 miles south of Bakersfield.

The present equipment of the Bakersfield steam plant consists of two turbo-generators having a capacity of approximately 12,500 kilowatts. The new equipment to be installed will be a single unit Allis-Chalmers turbo-generator of 12,500-kw. capacity of the very latest design, constructed for operation under 250 pounds steam pressure. The necessary boiler installation will consist of a battery of ten 822-horsepower Sterling boilers manufactured by the Babcock & Wilcox Company. These boilers will have a capacity of approximately 15,000 kilowatts.

The current will be generated at 2,300 volts, and will step up through a bank of three 70,000-volt transformers for delivery on to the high line transmission system of 60,000 volts.

The first installation in the new Oilfields Steam Plant will be a 15,000-kw. turbine. There will be an accompanying installation of eight 825-horsepower boilers to maintain 250 pounds pressure at 125 degrees superheat. This unit will consume approximately 9,000,000 cubic feet of natural gas daily. Each additional unit in the Oilfields plant will require an additional 9,000,000 cubic feet of gas. The four units will be installed as rapidly as possible, providing the natural gas supply warrants the investment. The cost of the initial unit, including building, building site and headquarters buildings will be \$1,769,850. It is estimated that each additional unit will cost approximately \$1,000,000. The plant will feed into the new 110,000-volt transmission system at the McKittrick sub-station.



# Hydro-Electric Development on the Feather River

BY J. H. ANDERTON

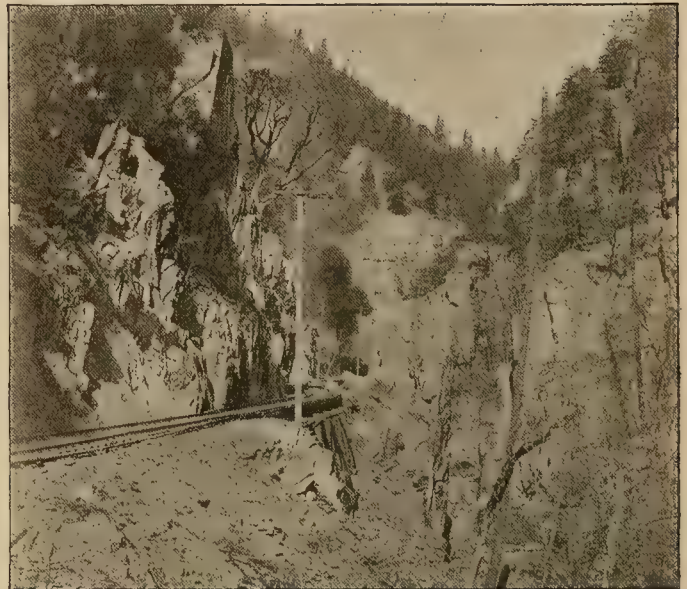
(The industrial development of California is involving a demand for electric power which is increasing faster than the power companies supply it. One of the largest developments being undertaken to meet the growing need, is described in the following article by the chief electrical engineer of Stone & Webster Co.—The Editor.)

With perhaps one exception, nowhere on the continent of North America can there be found a river having such wonderful possibilities for the development of electrical energy as the Feather River, one of the great natural drainage streams of the Sierras. Situated for almost its entire length in a gorge of unvarying scenic beauty, where the water tumbles in a series of rapids for mile upon mile, and paralleled by one of our great transcontinental railways, it is not only a delight to the eye of the modern traveler, but a fascinating object of study for the engineer.

## Topography

The principal source of the river lies in Plumas County, largely in a natural basin known as Big Meadows, into which numerous small tributaries flow from the slopes of Mt. Lassen and other notable peaks to lend their volume to the North Fork or main branch of the stream. The principal source of power on the river is the North Fork, as will be noted from the relief map which shows only one power development projected below the junction of

the two forks. The total distance along the river from Big Meadows to the junction with the Sacramento is approximately 140 miles. The part of the river suitable for power development is that between Big Meadows, the source, and Oroville, a distance of approximately 75 miles, and it is this latter which



Looking toward the site of the Caribou power house No. 2, on the system planned by the Great Western Power Company on the North Fork of the Feather River.



Looking down the North Fork of the Feather River. The total fall in the river from the Big Meadows dam to Oroville is 4,285 ft.

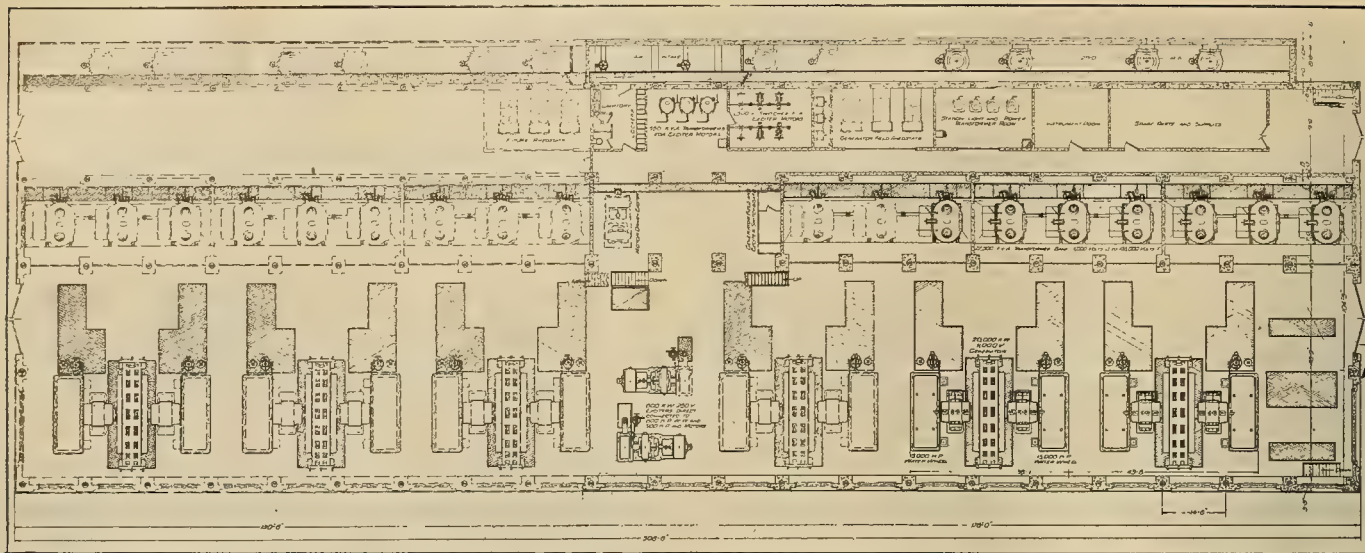
is embraced within the property of the Great Western Power Company of California.

The total fall or natural head in the river from the spillway of the Big Meadows dam to Oroville is 4,285 feet, the elevation at Oroville being only 170 feet above sea level. The drainage area or watershed tributary to Big Meadows is 504 square miles, practically all of which is favorably located for maximum conservation of the precipitation over the neighboring Sierras. The drainage area tributary to the River between Big Meadows and Oroville, is approximately 3,000 square miles. The total average annual runoff in the Big Meadows basin alone over a period of thirteen years is 842,000 acre feet, with the usual occasional flood peaks much in excess of this.

## Power Possibilities

Considering only the possibilities of the Big Meadows drainage area and assuming the 72 per cent of the total head between Big Meadows and Oroville is made available at the water wheels with an efficiency of generation of 80 per cent and 70 per cent load factor, the ultimate development would be approximately 350,000 kw., and it should be noted that this calculation does not take into account the drainage area tributary to the river below the Big Meadows dam. Realizing the tremendous possibili-





First floor, Caribou power house. The present installation consists of two 20,000-kw. units, two exciters and two transformer banks.

ties of this source of energy, the Great Western Power Company some years ago determined upon a comprehensive plan of development which should have for its ultimate object a suitable number of properly located power houses and trunk line transmission and distributing systems which would deliver this power to the markets of California, more particularly for use in the San Francisco Bay District.

Travelers through the Feather River Canyon may see side by side for miles two remarkable examples illustrating the progress in the art of transportation and engineering—one the old Caribou Trail made famous in literature, winding around the mountains, limited in location and capacity and traveled by the pioneers and gold hunters of bygone days, a majority of whom used the very water which, unknown to them, held within itself potential values enormously in excess of the gold which they uncovered by its use; the other, the modern effort of engineering in the art of transportation, practically unlimited as to location and capacity—in short, the modern electric transmission line.

The first step toward harnessing the water powers of the Feather River on a large scale was undertaken when a dam was built and a tunnel driven through the rock to divert the water from Big Bend in order to permit gold mining operations being carried on in the bed of the river. Later the Great Western Power Company acquired the tunnel and water rights of the gold mining company and formulated plans for utilizing them in an hydro-electric development. In 1909 the Big Bend power house of the company began generating electrical energy and ever since then has been transmitting it 154 miles to Oakland at 100,000 volts. This development constituted the earliest 100,000-volt transmission system in the world.

#### Plans for Future Development

With the growth of demand for electrical energy, steps were taken toward the development of

the system and a comprehensive plan laid down in 1910, when work was commenced upon the construction of a dam which would conserve and control the flood waters of the river at Big Meadows. This dam is an earth-filled structure 600 feet long and contains approximately 300,000 acre feet of water, which thus forms Lake Almanor, having an area of 15,500 acres and an average depth of 19.5 feet. By raising the crest of the dam 28 feet, the capacity of the lake might be increased to approximately 1,250,000 acre feet, with an area of 27,000 acres. Since the average runoff into the Big Meadows basin is given as 842,000 acre feet per year, the wisdom of a dam capable of impounding 1,250,000 acre feet of water might be questioned at this time. However, the rapidly increasing value of water power to our economic and industrial advancement is such that methods by which the occasional flood year waters may be conserved to give a more nearly uniform flow will have to receive serious consideration. When this time comes, the Great Western Power Company will be in an excellent position to provide properly for it.

In general, the ultimate scheme of development contemplates a series of seven power houses located at strategic points on the river and all successively utilizing the controlled waters of Lake Almanor, amplified by the natural runoff of the watershed between the lake and the last power house, which is near Oroville. As at present outlined, the following notations will apply to each of the power houses for the ultimate development:

Power House	Location	Transmission distance from San Francisco Miles	Length of Tunnel Feet	Maximum Head Feet	Capacity Kw.	No. of Units
No. 1 Butt Creek	Butt Creek, near south portal of Tunnel from Lake Almanor	225	11,200	334	25,000	3
No. 2 Caribou	North Fork of River, 10 miles from Lake Almanor	195	22,950	1,008	120,000	6
No. 3	North Fork of River, 18 miles from Lake Almanor	187	10,500*	450	60,000	4
No. 4	North Fork of River, 38 miles from Lake Almanor	167	10,500*	650	93,000	5
No. 5	North Fork of River, 50 miles from Lake Almanor	155	17,000*	400	60,000	4
No. 6 Big Bend	North Fork of River, 58 miles from Lake Almanor	147	15,038	435	80,000	8
No. 7	Below junction of North and East Forks of River, 75 miles from Lake Almanor	130	16,000*	270	48,000	4

\*Approximately.



The total available river head utilized in the above developments is 85 per cent; the total kilowatt development, 486,000.

### Financing

Of the above total hydro-electric development the company now has in operation and under construction a total of 105,000 kw., leaving a balance for possible future extensions of 381,000 kw. The estimated expenditures required for the complete development of the river, excluding that already provided for, are as follows:

Power House No. 1 .....	\$ 5,000,000
Power House No. 2, to complete .....	16,000,000
Power House No. 3 .....	12,000,000
Power House No. 4 .....	18,600,000
Power House No. 5 .....	12,000,000
Power House No. 6, to complete .....	3,000,000
Power House No. 7 .....	9,600,000
<b>Total .....</b>	<b>\$76,200,000</b>

The rate at which this money will be required will, of course, depend primarily upon the general industrial development of the district which the Great Western Power Company serves, and, secondarily, upon the activities of competing companies. However, the rate of growth of the company, as shown by the demand upon it for a number of past years, is a fair indication of its future requirements and upon this basis, indications are that average yearly monetary requirements for extension of hydroelectric generating equipment during the next ten years will be approximately \$1,500,000. The above figure presupposes a growth consistent with that of the past years. It does not include any provision for transmission, distribution or steam reserve, and on the assumption that such projects as the much discussed trunk line railway electrification or other similar projects should develop, the necessary expenditures will, of course, be proportionally increased.

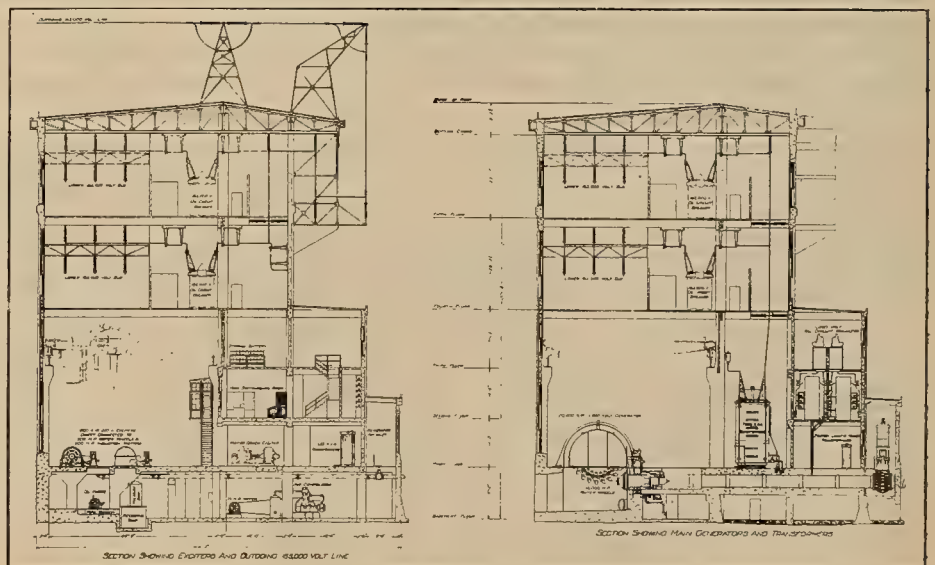
### Transmission Requirements

Among the items of interest in connection with the ultimate development of the river are the transmission lines required to conduct this power to market. The remarkable success of high voltage trans-

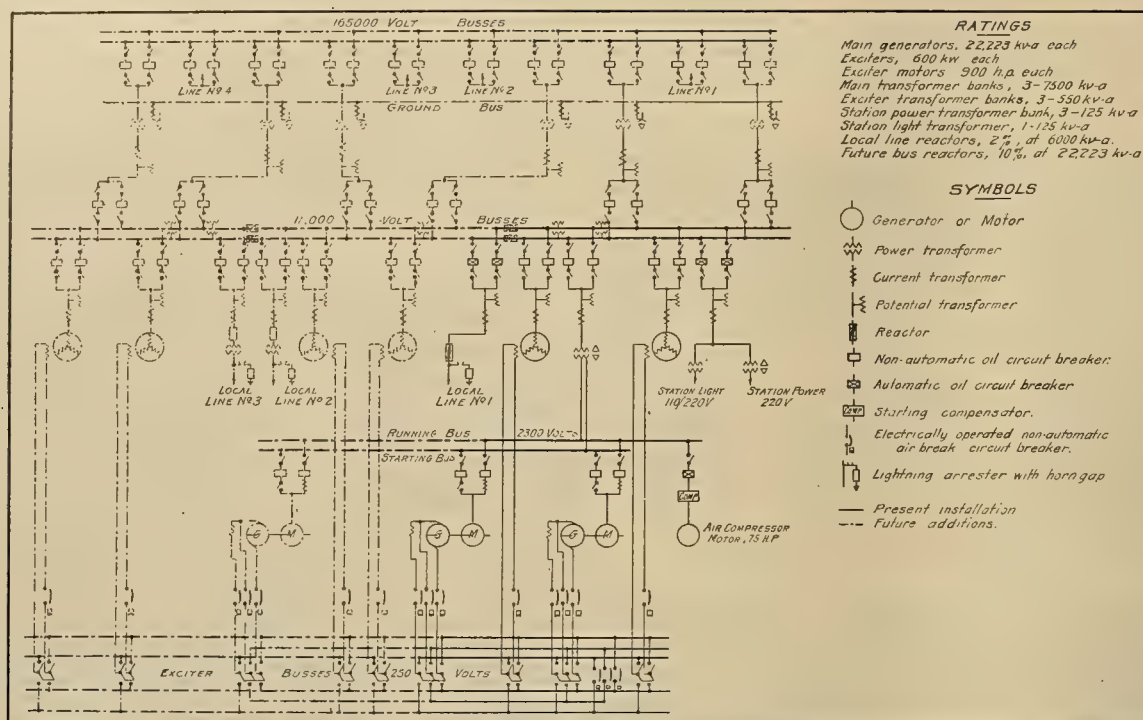
mission, as exemplified in the Big Creek 150,000-volt project, has encouraged engineers to consider the use of still higher voltages in order to effect yet greater reduction of conductor for a given load transmitted. The electrical limit of transmission at the present time appears to be about 220,000 volts. However, at this voltage large conductors must be used to keep down the corona losses, and enormous blocks of power must be transmitted if reasonable first cost and economical operation is to result. If a voltage of 220,000 were adopted for transmitting the ultimate power to be developed by the Great Western Power Company, the total number of lines required would be four, including a spare line which could be used for synchronizing, but adoption of this voltage would necessitate initial expenditures which cannot be justified by the power to be developed at present. The Great Western Power Company have therefore adopted a voltage for the new development of 165,000 volts at the generating end. This voltage is the highest of any in the world, either operating or under construction. The total number of lines which would be required for the proper transmission of the ultimate power at 165,000 volts is seven, including the spare line which can also be used for a synchronizing line.

The regulation of the system will necessarily be controlled by synchronous condensers, or their equivalent, and the total kva, required for the 165,000-volt system will be approximately 280,000. For a 220,000-volt system, the initial condenser equipment required for proper regulation would be quite large compared to the capacity of the generating equipment. The ultimate condenser requirements, however, for the total development at this voltage would be much less than 165,000 volts. The reduction in the number of lines and synchronous condenser capacity must not, however, be construed as sufficient basis of comparison between the two voltages, since 220,000-volt lines cost considerably more to build than lines for 165,000 volts, also switching equipment, transformers and their housing are considerably more expensive for the higher voltage. Nevertheless, for a development which involves sufficiently

Composite sections of Caribou power house. The present length of the power house is 176 ft., but the length of the ultimate building will be 308 ft., and it will be designed to accommodate when complete, six 20,000-kw. units, six 22,500-kva. transformer banks, four 60,000-kva. 165,000-volt transmission lines and three local distributing lines.







Scheme of connections, Caribou power house

large blocks of power from the outset, greater economy would result through the use of 220,000 volts.

### The Caribou Development

At present the company has under construction the development for power house No. 2, known as Caribou. This power house will have an ultimate capacity, as previously mentioned, of 120,000 kw. in six units. The present installation will consist of two units and provision for a third with the usual auxiliaries.

The course of the water for the Caribou development is from Lake Almanor through tunnel No. 1 to Butt Creek, where the stream bed of the creek is utilized for a distance of 8 miles, terminating at a diversion dam, which incidentally produces the largest forebay in California. The natural flow of Butt Creek is, of course, added to that coming through tunnel No. 1 from Lake Almanor. From Butt Valley the water flows through tunnel No. 2 to the crest of the ridge behind the power house, where it empties into tunnel No. 3 and thence through individual penstocks for each of the water wheels.

The principal hydraulic work consists of the three tunnels, known as 1, 2 and 3, having the following characteristics:

**Tunnel No. 1.**—Located between Lake Almanor and Butt Creek. Area, 40 square feet. Section rectangular. Slope, 1 per cent. Length, 11,200 feet, with three shafts. Lining, part concrete and part wood. Capacity, 800 second feet of water. Equipped with two 7-foot electrically controlled gates at its entrance.

**Tunnel No. 2.**—Located between the south end of Butt Valley and the crest of the river gorge. Area, 63.62 square feet. Section, circular. Diameter, 9 feet. Slope, .8 per cent. Length, 9,200 feet. Number of shafts and adits, 2. Lining, concrete. Capacity, 1,000 second feet of water. Equipped with a nine foot electrically controlled gate at the entrance.

**Tunnel No. 3.**—Located between the crest of the gorge and the power house below. Area, 63.62 square feet. Section circular. Diameter, 9 feet. Length, 2,550 feet. Number of

adits and shafts, 2. Lining, combination steel and concrete. Capacity, 1,000 second feet of water. This tunnel drops with a slope of 37 degrees to the elevation of the water wheels and thence runs horizontally for 300 feet to the face of the wall of the gorge where it empties into the horizontal penstocks.

Near the lower end of tunnel No. 2, about 100 feet from the entrance to tunnel No. 3, there will be a surge chamber 200 feet deep from the ground surface.

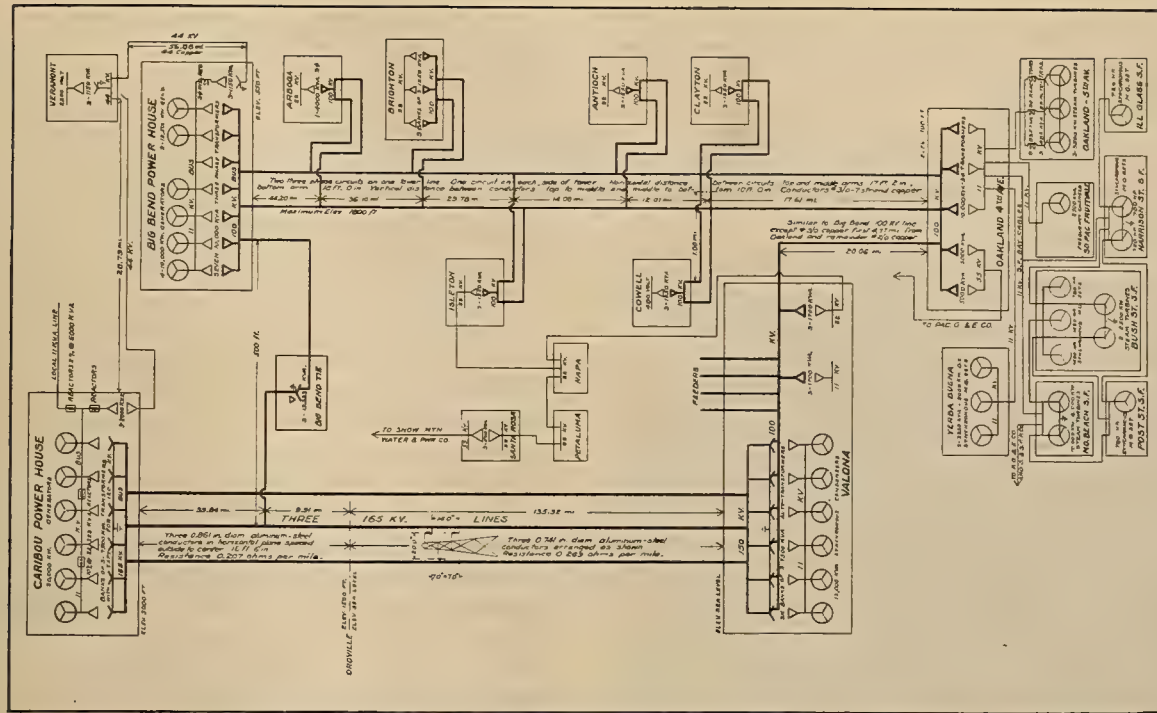
In order to provide adequate transportation for men and materials to construct the tunnels and power house, 9.25 miles of standard gauge railway was built connecting with the Western Pacific Railways at Howells. The take-off at this point necessitates a timber trestle and bridge containing 1,000,000 feet of timber. This railway terminates at the power house and is built in the river gorge. A series of three motor operated incline railways is built from the gorge into Butt Valley and to the summit overlooking the lake. These inclines have a total length of one mile and a grade varying from 25 to 50 per cent. A narrow gauge railway was also built 10.5 miles long through Butt Valley to the south portal of tunnel No. 1.

### Caribou Power House Equipment

The power house is a reinforced concrete structure having the following dimensions: Height, 105 feet; width, 104 feet; present length, 176 feet; ultimate length, 308 feet.

The present building is designed with the future extension in view and will accommodate three 20,000-kw. units, three 600-kw. exciters, three 22,500-kva. transformer banks, two 60,000 kva., 165,000-volt transmission lines, one 6,000-kva., 11,000-volt outgoing line and miscellaneous auxiliaries. The ultimate building is designed for a total of six 20,000-kw. units, six 22,500-kva. transformer banks, four 60,000-kva., 165,000-volt transmission lines and three





local distributing lines. The present installation consists of two of the 20,000-kw. units, two exciters and two transformer banks. The 20,000-kw. units will each consist of two overhung impulse type wheels, having 21 buckets, to operate under a head of 1008 feet with a speed of 171.4 r.p.m. Incidentally, each bucket weighs 2200 pounds. The jet diameter is 11 inches. Regulation is by means of two governors, one on each nozzle, actuating a direct operated needle by oil pressure. Two automatic pressure relief valves are also provided with each unit designed for operation by the governors to discharge water directly into the tail race in response to a predetermined pressure rise.

The generators are rated 22,223 kva. at 90 per cent power factor, three phase, 11,000 volts, Y connected. The generator windings are brought out of the machine at both ends for differential protection against internal breakdown. The shaft of the unit weighs 20 tons and has a diameter at the bearings of  $24\frac{3}{4}$  inches. Each of the two bearings is 72 in. long. The total weight of the revolving element of the unit is 170 tons and of the whole unit is approximately 290 tons.

The transformers are of the usual oil-insulated water-cooled type. Each transformer is of 7500-kva. capacity and will be delta connected on the low tension side for 11,000 volts and Y connected on the high tension side for 165,000 volts, with the neutral grounded through indicating instruments and alarm devices. These transformers are also equipped with the new oil conservator and will have imbedded temperature coils. It is of interest to note that the transformers for the Big Creek system are each rated 5833 kva. at 6600 to 86,600 volts (150,000 volts Y), are 26 feet high over the bushings and weigh 75 tons each with oil, while the Caribou transformers are 7500-kva., are the same height and weigh only

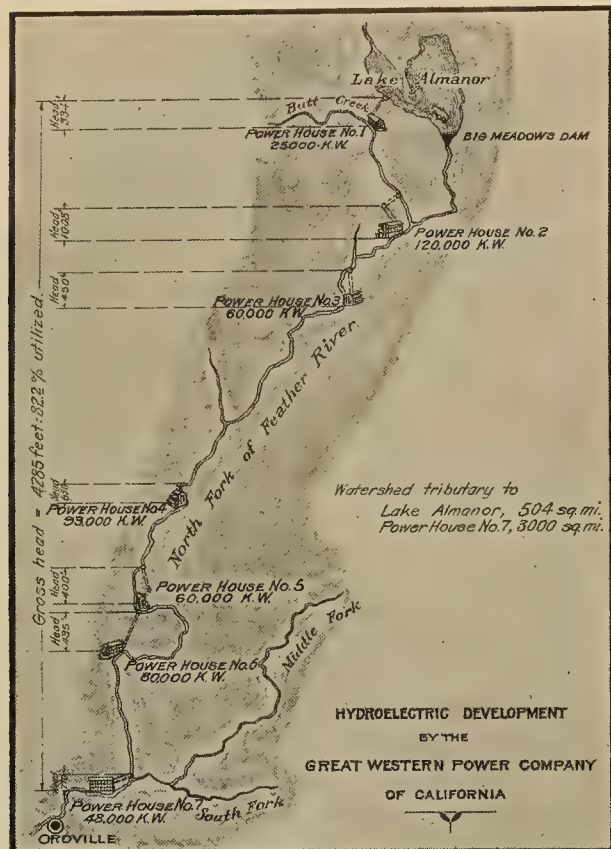
45 tons. Both transformers were made by the same manufacturer.

The switching equipment consists of selective oil circuit breakers with duplicate busses on both the 11,000 and 165,000-volt sides. The ultimate development of the station will require two sets of 10 per cent reactors in each of the low tension busses in order to keep the short circuit currents within the rupturing capacity of the oil switches. Careful computations have been made as to the magneto-mechanical stresses which may be set up by short circuits when the system is enlarged with the result that bus insulators spaced on an average of 28 inches are designed for a mechanical stress of 1200 pounds in any direction. Each of the 11,000-volt and 165,000-volt busses are entirely isolated from its duplicate and each bus and switch room is again divided into sections embracing one generator and one transformer bank on the low tension side, and one individual switch on the high tension side. It may be mentioned that each 165,000-volt oil switch occupies a space of 24 feet 10 inches by 9 feet by 17 feet high without clearance and weighs 26 tons complete with oil.

The two 600-kw. exciters are each capable of exciting the fields of three generators. They are designed as three unit sets for operation by water wheels or by induction motor. The third exciter will be motor operated only. The exciter voltage, and therefore the station voltage, will be controlled by Tirrell regulators acting directly upon the exciter field rheostat. These exciters are the largest in capacity that can be controlled directly by regulators without the interposition of secondary exciters. Some slight modifications were made in the regulator in order to avoid using secondary exciters in this plant and no difficulty is expected in controlling the exciter voltage from zero to maximum.



Extreme care was taken before placing the order for the main generators to see that a design was presented which would not give a self-exciting characteristic when connected to an unloaded transmission line having the constants of the Caribou line. That is, it was important to guard against extreme and prolonged over-voltage or overload conditions on



The principal source of power on the Feather River is the North Fork, the part between Big Meadows and Oroville being specially suitable for hydroelectric developments as planned by the Great Western Power Company.

the generators, even though the excitation were reduced to zero or reversed. With the design, as finally adopted, it is expected that zero excitation will give less than full load current on the generators with open circuit at the receiver end.

### Construction of Transmission Line

One transmission line will be built at present. It will have a total length between Caribou power house and Valona substation of 185.1 miles. The conductor and towers are of two types. For fifty miles at the power house end, where the elevation ranges from 4,000 feet down to 300 feet, the conductor is aluminum steel .861 inches in diameter, and the towers are designed with conductors disposed in a horizontal plane 22 feet on centers. For the remaining distance, the conductors are aluminum steel .741 inches in diameter, and the towers are designed with the conductors disposed in a triangular form having an average spacing of 18.8 feet. The insulators used will be of the disc type and will have ten discs in series for suspension, and 12 discs in series, 2 sets in parallel, for dead ends.

A new device in transmission line construction is to be used on this line. It consists of a cast iron disc 12 inches in diameter,  $\frac{1}{8}$  inch thick, with a rolled edge 1 inch in diameter. These discs will be placed between the wire and the insulator nearest thereto. Most remarkable results have been shown in the laboratory tests regarding the potential gradient of the insulators equipped with this device, which is the invention of Mr. Koontz, electrical engineer of the Great Western Power Company.

At a point near the Big Bend power house, compensators will be installed to connect the existing 100,000-volt system to the new 165,000-volt system. These compensators will be Y connected, permanently grounded and provided with a tertiary winding connected in closed delta for suppression of the third harmonic currents. This method of connection between the two systems will furnish a definite ground for the neutral of the present 100,000-volt delta connected system. At Valona substation two 22,500-kva. banks of compensators will be provided, Y connected and permanently grounded. These compensators will also be provided with closed delta connected tertiary windings to which will be connected two 15,000-kva., 11,000-volt synchronous condensers. The ultimate development of Caribou will require six 22,500-kva. banks of compensators and six 15,000 kva. synchronous condensers at Valona. The present difficulty of obtaining materials in a reasonable time will make necessary a temporary connection between the Caribou development and Big Bend. For this purpose, advantage will be taken of the 120,000-volt tap which has been provided in the Caribou transformers and direct connection will be made at Big Bend power house to the existing delta delta system; a similar connection will also be made at Valona, pending receipt of the necessary compensators and synchronous condensers for connection at Big Bend and Valona.

The following figures apply to the electrical characteristics of the line and for purposes of comparison are given with and without the use of synchronous condensers:

#### COMPARISON WITH AND WITHOUT CONDENSERS ZERO LOAD RECEIVED

Without Condenser		With Condenser
150,000	Receiver Volts.....	150,000
133,750	Generator Volts.....	165,000
18,800	Generator Kva.....	2,100
390	Generator Kw.....	776
2.04% Lead	Generator P. F.....	40.1% Lead
-10.2%	Line Volts drop in per cent of Gen. Volts.....	9.09%
	Condenser Kva.....	21,700 Lagging

#### 54,000 KW. RECEIVED

Without Condenser		With Condenser
150,000	Receiver Volts.....	150,000
220,800	Generator Volts.....	165,000
75,400	Generator Kva.....	60,850
63,000	Generator Kw.....	60,800
83.5% Lag	Generator P. F.....	99.99% Lead
85.6%	Efficiency of Transmission.....	88.7%
65%	Voltage Variation Gen. End.....	0
62.2%	Reg. Receiver End with Loss of Load and Condensers.....	21.2%
81.9%	Reg. Line and Trans. with Loss of Load and Condensers.....	19.3%
243,300	Max. Voltage (Receiver End).....	182,000
250,000	Minimum Insulation Required.....	190,000



## British Columbia Interconnections

BY J. LIGHTBODY

(The progress and well-being of the electric utilities in British Columbia is of utmost importance to their neighbors on the south, and increasingly so as interconnection becomes more important. The following account of a development characteristic of electrical progress in the West is by a member of the British Columbia Electric Railway Company.—The Editor.)

While California and Oregon will soon be linked together with a continuous circuit of copper north and south, central stations farther north have not been idle. Already the link exists over the Canadian border into British Columbia, connecting up central stations in the vicinity of Vancouver, B. C., with their neighbors immediately south in Washington.

Twenty miles north of the 49th parallel lies Vancouver, together with the adjacent municipalities making up Greater Vancouver, the cities of North Vancouver and New Westminster and the towns of Steveston, Port Moody, White Rock, Cloverdale, Abbotsford and Chilliwack on the Canadian side, and Blaine, Washington, are supplied by the British Columbia Electric Railway Company with electric light and power service and some of them with electric railway service. These lines comprise the mainland system which is distinct from the Vancouver Island system of the British Columbia Electric Railway Company centering at Victoria, B. C.

The company's two power plants at Lake Buntzen, sixteen miles from Vancouver, have a capacity of 47,700 kw. and its system is connected at its receiving station at Horne-Payne with the Western Power Company of Canada from which it takes power. The latter company in turn is connected with the Bellingham, Washington, system of the Puget Sound Power and Light Company, and if the gap of some 30 miles between the Bellingham and Seattle were filled, the high tension circuits extending south would be continuous into British Columbia.

The development at Lake Buntzen includes storage, the water being stored first in Lake Coquitlam and then in Lake Buntzen which it feeds, before operating the Pelton wheels under a head of 400 feet. The rainfall on these lakes has averaged more than 150 inches a year for a number of years. Lake Coquitlam, where the major portion of the water is stored, was enlarged by a 90-foot dam of rock and it is connected with the lower lake by a tunnel  $2\frac{1}{4}$  miles in length.

The British Columbia Electric Railway Company

has \$43,000,000 invested in its public utilities in British Columbia. Besides its light and power systems, it operates street cars in Vancouver, North Vancouver and New Westminster on the mainland and in Victoria on Vancouver Island. It has 156 miles of interurban line on the mainland, connecting Vancouver, New Westminster, Steveston and Chilliwack, the line to Chilliwack being 76 miles long. It has an interurban line of 22 miles on Vancouver Island, the total mileage of railway being 367. In addition to these properties, it operates the gas companies in Vancouver and Victoria, under the names of the Vancouver and Victoria Gas Companies respectively.

This company was formed in 1893 to take over

the companies then operating in the territory, and subsequently it took over others. The capital has been provided practically entirely by English investors, who are represented by a board of directors in London, while the management is in the hands of a general manager at Vancouver.

The territory covered on the mainland measures about 80 miles long and 25 miles broad, in which there are 14 substations. Except around Vancouver, the territory is comparatively

sparsely populated. Up to 1913 the country expanded at a rapid rate, and since the war this is again the case. Consequently the company has been called on at times for rapid expansion of its facilities. The total energy generated rose from 50,000,000 kw-hr. in 1910 to 152,918,529 kw-hr. in 1919. The maximum 10-minute peak which occurred at 4:45 p.m. on November 27, 1919, was 43,800 kilowatts, while the maximum hourly output for 1919 was 41,000 kw-hr. The average load factor on the system is 40 per cent.

The company's territory follows mostly the interurban lines and in fact, the company has been the cause of the development of the entire district. It has 45,600 lighting customers and 2,300 power customers on the mainland. In the city of Vancouver it has the entire domestic service, the Western Power Company supplying some of the industrial



Plant No. 1 on the Lake Buntzen development of the British Columbia Railway Company. This and one other plant on the same lake have a combined capacity of 47,700 kw.



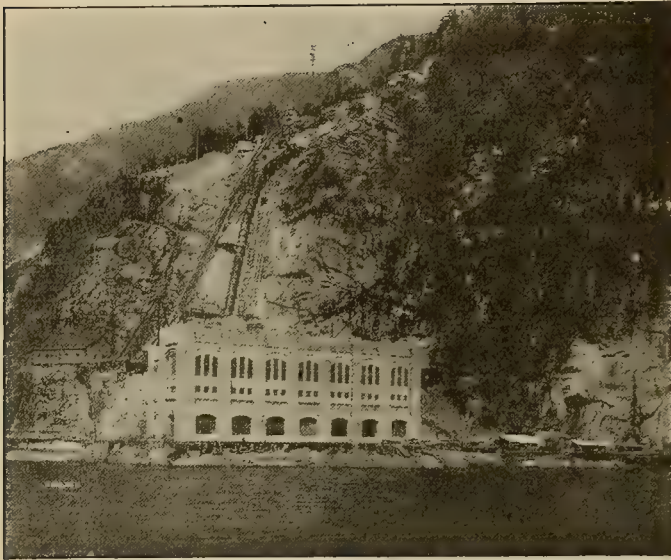
demand. In North Vancouver it has the whole field. In the city of New Westminster, power is bought by the city en bloc from the company and distributed to lighting customers by the city's own distribution lines. The company retains the power business. The other districts are mostly rural, including several towns of 500 to 2,000 inhabitants. The town of Blaine, Washington, also buys power en bloc and retails it to customers itself.

Vancouver not having the number of war industries of some cities, it was not affected to any extent by the cessation of hostilities. Two steel shipyards and a number of wooden shipyards were operating and continued to operate until recently, but they are expected to resume at an early date. The increase

supplied with power and light when at all within reach of existing pole lines.

The district adjacent to Vancouver is made up largely of the delta of the Fraser river. At certain seasons, during the time of high tides, it would be under water if an extensive dyking had not been done. To keep the land from being flooded during the rainy period, pumping is resorted to and this provides a good load. One such pump located near Ladner has a capacity of 20,000 gallons a minute, and there are numerous others of smaller size.

The load on the central stations in British Columbia is increasing very rapidly owing to new industries and the influx of settlers. Many thousands of Canadian soldiers from other provinces were dis-



LAKE BUNTZEN PLANT No. 2

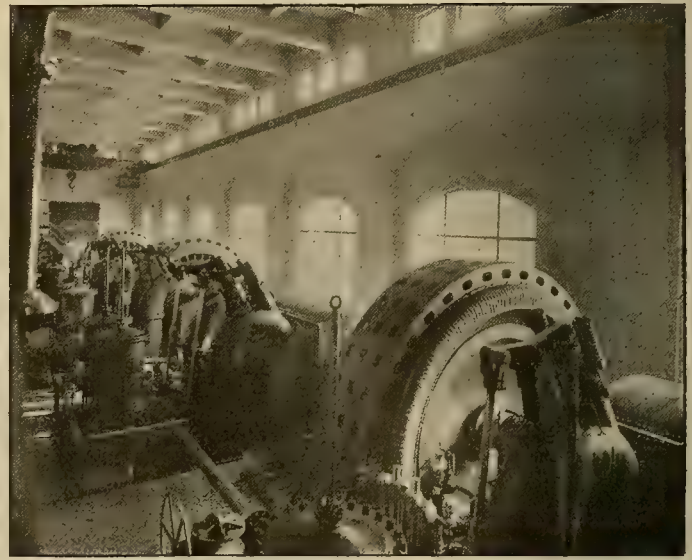
Plant No. 2 on the British Columbia Railway Company's development at Lake Buntzen. The rainfall on this lake has averaged more than 150 inches a year for a number of years.

in other loads has more than made up for the drop in the power load these yards occasioned.

The largest industry around Vancouver, and for that matter in British Columbia, is lumbering. Lumbering is one of the chief industries along the Fraser Valley interurban line and a large number of the mills in the vicinity of Vancouver and New Westminster are on the company's freight lines. Electric power has a strong competitor in these lumber mills in which steam can be generated cheaply by using waste material, but in spite of this, electric power is used to some extent in every mill along the Fraser Valley between Vancouver and Chilliwack and in most other mills around Vancouver and New Westminster.

At Steveston, 14 miles from Vancouver, at the end of one of the interurban lines, there are a score of salmon canneries, practically all of which are supplied with electric power, but these are only a seasonal load and the big season comes only once in four years when the salmon run.

There are the usual evaporating plants, fruit canneries, milk factories, and so forth to be found in rural communities, connected with the company's lines along the Fraser Valley. Farms there are well



GENERATOR ROOM—LAKE BUNTZEN PLANT

Generators at No. 2 Power House on Lake Buntzen. The company generated 152,918,529 kilowatt-hours in 1919. The average load factor on the system is 40 per cent.

charged in British Columbia. These factors are causing the province to develop fast.

There is no shortage of power available for development at the present moment. A recent government survey placed the amount of power within a radius of 50 miles of Vancouver, including that developed, at 300,000 hp. British Columbia has several million horsepower in her streams, but much of it lies at distances of 100 to 150 miles from Vancouver and is separated from it by difficult country.

### NATIONAL RAINFALL

In a dry season such as this it is encouraging even to speculate upon the amount of water which falls yearly upon this country. It has been estimated that the average amount of water which descends as rain or snow in the United States is enough to fill Lake Ontario two times and leave something over for a third time; and further, four years of rainfall would probably be enough to fill all the Great Lakes. The rain descends from clouds which average half a mile in height, and in raising the water to this height before falling Nature must perform the work of lifting 3,166,000,000,000 tons one mile per year. This is equal to 1,920,000,000 continuous horsepower.



# Electric Extensions in California

BY P. M. DOWNING

(The growing diversity of the load is one of the most outstanding features of the abnormal demand for power which has sprung up during the past few years. Power companies which have ordinarily looked upon lighting as their principal responsibility now find themselves called upon for great quantities of power for other purposes. The following account of some contemplated California extensions is by the vice-president in charge of electric operation with the Pacific Gas & Electric Company.—The Editor.)

During the recent world war but few if any of the power companies of the country were able to increase their generating plant facilities to keep pace with the demand for power. The power requirements of essential war industries created such an abnormal demand for service that the small margins of reserve plant capacity ordinarily maintained were very soon wiped out. Unsettled financial and labor conditions made it impossible to undertake any new work, except such as was absolutely necessary to meet the ever increasing demands for power.

## Rice Irrigation Load

Along with the usual requirements of the various war industries were those of allied industries having to do with the production of foodstuffs. In the north central part of California the industry falling within the latter classification that has created the greatest demand for power is rice irrigation. Between 1912 and 1919 the acreage planted to rice increased from practically nothing to 166,826, thus creating for this one industry alone a demand of approximately 17,500 hp.

Rice irrigation pumping is a seasonal load extending, approximately, from April 15th to Sept. 15th. Unfortunately, the latter half of this pumping period occurs at a time when the natural flow of the streams supplying the hydroelectric plants is at a minimum and has to be supplemented by stored water. During the past three years the situation has been particularly aggravated by reason of the unusually low precipitation. In addition to the stream flow shortage the water plane has lowered, thus increasing the distance the water has to be lifted.

A graphic illustration of the actual and estimated increase of the load of Pacific Gas & Electric Company from 1910 to 1928 is shown on the accom-

panying chart entitled: "Estimated and Actual Peak and Average Loads—Pacific Gas & Electric Co." From this it will be seen the kw-hr. deliveries into the system increased during that period from 509,250,334 in 1910 to 994,557,418 in 1919. During the same time the peak increased from 96,202 in 1910 to 187,135 in 1919.

The fact that during this period the increase has been at practically a uniform rate gives an excellent basis on which to estimate the probable increase that may be expected during the next few years. Following the projection of this load curve indicates that we may reasonably expect an annual increase in energy output of 75 to 100,000,000 kw-hr. which, at the prevailing load factor, will require 15 to 20,000 kw. of installed capacity to supply.

## Construction Plans

To meet this increasing demand for power the Pacific Gas & Electric Company has outlined a comprehensive construction program extending over a period of years, which includes extensive developments of both generating and transmission facilities.

To meet the urgent demand that may reasonably be expected during the coming irrigation season by reason of the subnormal precipitation of the last three years, a 12,500-kw. steam tur-

bine with the necessary boilers, auxiliaries, etc. will be installed in Oakland. Shipment on this has been promised for July 1, 1920, thus allowing ample time for its installation before the most critical period of the short water season this fall.

At the Stanislaus plant on the Sierra system a third pipe line is being installed. This will increase the peak load capacity of the plant from 34,000 kw. to 40,000 kw. The original rating of the generators in this plant was 6700 kw. each. They have since



Power stations, principal electric substations, gas generating plants and electric transmission and distributing system of the Pacific Gas & Electric Company.



been rebuilt and, equipped as they now are with forced ventilation, they have a re-rated capacity of 10,000 kw. each. On the basis of the new rating, the peak load that can be carried on the plant has been limited by the pipe lines. With increased pipe line capacity and its present ample forebay storage this plant will become a very important factor in handling peak loads.

The diversion of water for the Stanislaus plant is made at Sand Bar on the Middle Fork of the Stanislaus river. In common with other streams having their origin in the southern Sierras, this stream has a large seasonal variation. The minimum flow is supplemented by water supplied from storage reservoirs, the most important of which are Relief, located on Relief Creek, a tributary of the Middle Fork, and Strawberry, located on the South Fork of the Stanislaus. The water from Strawberry is carried across the divide between the South and Middle Forks down the side of the canyon into the latter stream a few miles above Sand Bar, under an available head of 2335 feet.

It is proposed to utilize this head now being wasted by the installation of a single 9000-kw. generator driven by a 12,500-hp. impulse wheel. Three transformers will step the voltage up to 104,000 for transmission to Stanislaus Power House, a distance of 21 miles, where it will be delivered directly into the main transmission lines running to San Francisco.

### Power from Pit River

By far the most important development under consideration by the company at this time is that on Pit river. It is a significant fact that Pit river is the only stream flowing into the central valleys of California having its principal source of supply east of the Sierras. Rising near Goose Lake in the extreme northeast corner of the state, it flows southwest across a great plateau region, thence through the Sierras approximately 40 miles southeast of Mt. Shasta, finally flowing into the Sacramento river a short distance above Redding. The drainage area of this stream, above the point where it breaks through

the mountains, embraces approximately 4355 square miles, greatly exceeding that of any other Sierra stream above its point of descent into the valley. Its watershed is peculiar in that it is composed very largely of porous lava overlying a more impervious basalt or sandstone. The lava absorbs water very readily thus affording an underground storage that gives a uniformity of flow unequalled by any other Sierra stream. This uniformity of flow, together with the fact that the normal minimum amounting to approximately 2500 cubic feet per second can be utilized under an aggregate head of approximately 2000 ft., within a distance of 30 miles, makes Pit River one of the best and most reliable sources of hydroelectric energy in the West.

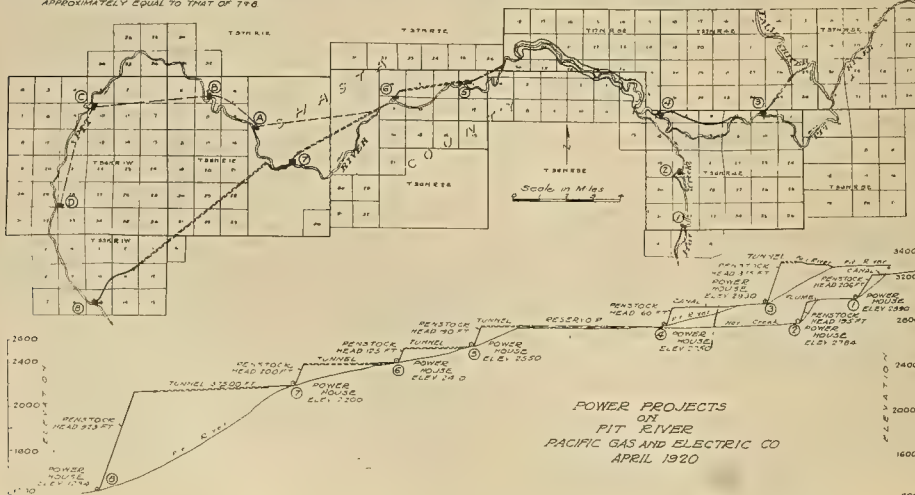
The power possibilities of the Pit River have long been known, but it is only within recent years since the art of transmitting electrical energy at present day voltages became known, that the potential energy of this stream could be considered as a possible source of supply for the Bay Cities.

The present plan of development contemplates the construction of a number of different generating stations on the Pit River and its tributaries and the construction of two or more main trunk transmission lines running from these plants to a main step-down transforming station to be located at some point in the vicinity of Carquinez Strait. Here energy will be delivered in to the existing system at 110,000 and 60,000 volts. No final decision has yet been reached as to the order in which these various installations will be made, or the ultimate voltage at which the transmission line will be operated. The length of this line will be approximately 220 miles and the construction will be such as will permit of its being operated at 250,000 volts.

By reason of the necessity of providing additional capacity at the earliest possible date, the first installation consisting of two 12500 kva. units will be complete and ready to put into operation by not later than June 1st, 1921. To complete the first transmission line will require two years. Until the main line is completed the output of this plant will

AVERAGE LOW WATER FLOW—CU FT PER SEC	2500	2500	2500	2500	1500	1400	600	400	TOTAL
AVAILABLE NET HEAD IN FEET	923	200	125	190	160	375	195	206	
AVAILABLE KW AT AVG LOW WATER 80% PLANT EFF	156,900	34,000	21,200	32,300	16,300	35,700	9,000	5600	310,000
KVA TO BE INSTALLED	200,000	50,000	30,000	50,000	25,000	50,000	12,500	12,500	430,000
POWER HOUSE REFERENCE NUMBER	* 8	* 7	6	5	4	3	2	1	

\* PROJECTS A AND B ARE ALTERNATIVE TO T-8, HAVING A COMBINED CAPACITY APPROXIMATELY EQUAL TO THAT OF T-8



The Pit river plan includes a number of generating stations and two or more main trunk transmission lines running to a main step-down transforming station. Here energy will be delivered into the existing system at 110,000 and 60,000 volts. The length of the line will be approximately 220 miles.



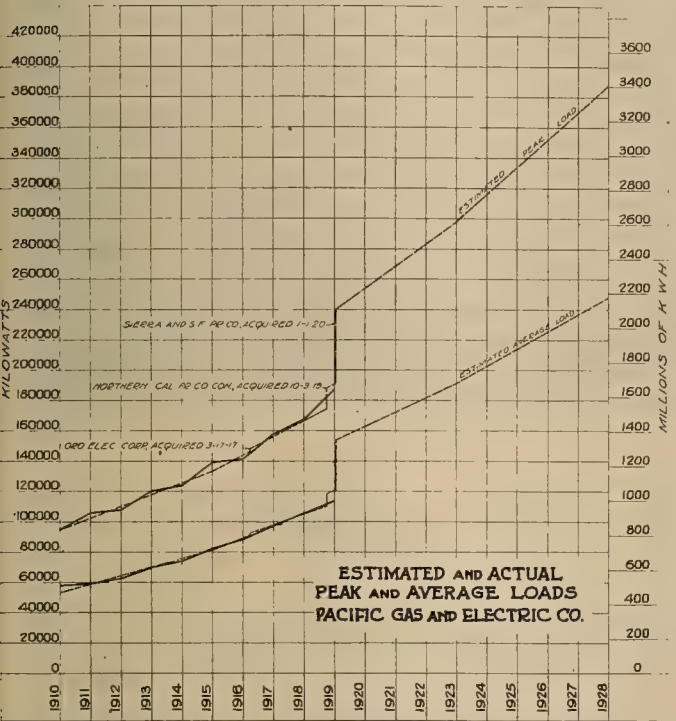
be delivered temporarily into the existing system at 60,000 volts.

With the completion of the main trunk transmission line and additional generating capacity that will permit of the delivery of energy in excess of that to be had from the first installation, it will be

circuit will give increased capacity from the plants in Yuba and Placer counties to Newark and the Southern end of the system, thus relieving the lines entering the bay districts via Cordelia and Carquinez and making them available for the additional power that will be brought in from the north.

A 60 kva. line is being constructed from Modesto to Newman, a distance of 35 miles. The San Joaquin Light and Power Corporation is also constructing a line to this place. When these two lines are completed the system of Pacific Gas and Electric Co. and the San Joaquin Light and Power Corp. will be tied together, thus completing an interconnected network of lines from Southern Oregon on the north and the Mexican border on the south.

From the accompanying load curve it will be seen that a conservative estimate of the annual increase in peak load is 15,000 to 20,000 kw. Under present day prices of labor and material hydroelectric installations, including generating plants, transmission lines and step-down transforming stations will cost approximately \$200 per kw. On this basis it will be seen that neglecting any consideration of investment in distribution facilities for marketing this energy, the capital expenditures necessary to produce and deliver this amount of power to the distribution centers alone amounts to between \$3,000,000 and \$4,000,000 per year.



Deliveries into the system increased from 509,250,334 kw-hr. in 1910 to 994,557,418 kw-hr. in 1919. These figures give a basis on which to estimate the probable increase to be expected during the next few years.

necessary to construct additional 110,000 volt lines from the main transforming station, to be located at or near Carquinez Strait, into Oakland to connect with the 110,000 volt line now under construction between that place and Newark. This will complete a 110,000-volt ring bus consisting of 334 miles of steel tower line, extending from Drum Power House, through to Cordelia, thence across Carquinez Strait to Oakland and on to Newark where it will connect with another line running from Drum via Halsey and Wise Power Houses to Newark substation. At the latter place the 110,000 volt lines of the Sierra and San Francisco system will be connected to this bus. The new trunk line from Pit River will also deliver energy directly into this bus at the proposed new substation near Carquinez.

**Additional Transmission Facilities**  
Another important addition to the Company's transmission facilities now under construction is a second circuit consisting of 161.5 miles of 3/0 copper on the Drum-Wise-Newark 110,000 volt line. This

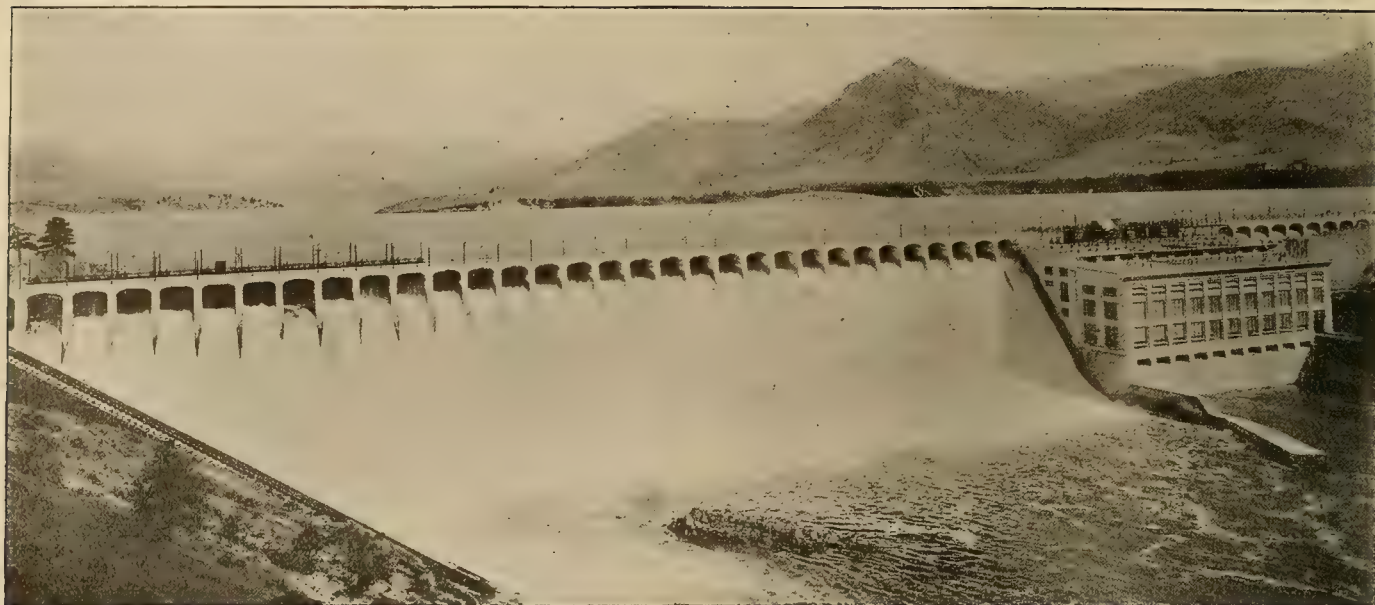
SAVING ON REPAIR PARTS FOR CONSTRUCTION WORK

The Kerckhoff project now being constructed on the San Joaquin river by the San Joaquin Light & Power Corporation under the engineering direction of R. C. Starr, involves the driving of a 17-ft. by 17-ft. pressure tunnel through solid granite. This sets a record for tunnel dimensions in hydroelectric work. Not only does this provide a greater capacity, but it has been found that through the fact that it is possible to use a steam shovel in excavation work and do away with the laborious and unreliable mucking machines, labor costs are greatly reduced and it is possible to make much greater progress in a day. At the present time an average of 12 ft. a day on each face worked is maintained.

In connection with the use of the steam shovel, it was of course found necessary to have on hand all the repair parts which might be needed, so that work should not be unduly interrupted. To provide a complete set of parts costs about the same as a new shovel complete,—in the neighborhood of \$14,000. It has been found economical to purchase instead a second-hand shovel, which can be obtained at a cost of some \$6,000. As parts are needed, they are borrowed from this machine. It is planned to replace the few missing parts at the end of the construction work and to sell the machine again at second-hand. The initial saving is of course, very large, and with the rising costs of all machinery it may be possible at a later date to further reduce the expense by selling the machine at more than was paid for it or at least at a price sufficient to cover the major part of the expense.

SYSTEM PEAK AND AVERAGE LOADS, LOAD FACTORS, AND PER CENT INCREASE					
Year	Peak Kw.	% Increase over previous year	Average Kw.	% Increase over previous year	Load Factor
1910	96,202	-4.3	58,746	.4	.612
1911	106,102	9.3	60,832	3.5	.573
1912	108,149	1.9	63,816	4.7	.591
1913	119,771	9.9	70,851	9.3	.59
1914	124,040	3.4	75,175	5.8	.606
1915	139,540	12.5	82,844	10.2	.594
1916	141,008	1.04	87,466	5.1	.62
1917	158,272	12.2	97,500	11.5	.616
1918	166,705	5.3	105,256	7.9	.631
1919	187,135	12.2	113,533	7.86	.607





General view of the dam at the Holter development of the Montana Power Company. The reservoir impounds 89,000 acre feet of water, the plant operating under a head of 107 ft., with an installed capacity of 40,000 kw.

## Montana Water Power Development

BY J. H. BONNER

(The West is exceptionally favored in the matter of water power, and the fact that it is a pioneer in the electrification of mines and railways is due in large measure to extensive hydroelectric developments such as those described below. The author is engineer of the Montana Public Utility Commission.—The Editor.)

A true account of the great development of hydroelectric power in Montana is surprising to one who is not familiar with the actual facts. By electricity, generated from flowing water, monster freight and passenger trains are driven over 530 miles of track, across three mountain ranges; the great mines and smelters of the state, with their tremendous output, are operated; over fifty towns and cities are supplied with light, heat and power; water is raised into irrigation ditches that supply thousands of acres of land; dozens of mills, street and interurban railways, cement factories and dredges are supplied with power.

The Montana Power Company, the largest power company in the state, has at the present time thirteen hydroelectric plants, scattered over the state with a total installation of nearly a quarter of a million kilowatts; 1922 miles of high tension transmission lines, connecting 75 sub-stations; and over 500 men employed in their operation. It has undeveloped sites that will supply 100,000 kw. more when the need arises. By great dams it has controlled the flow of rivers and so harnessed them as to bring electrical power within the reach of thousands, for economic and convenient use.

### Natural Advantages of Montana

Montana is one of the leading states in hydroelectric development. Nature was indeed lavish to the state in this regard. Two of the greatest rivers of the continent, the Missouri and the Columbia, have their source in the high mountains of Montana, and after traversing the state for great distances leave its borders at comparatively low elevations.

While these mighty rivers are considerable streams at elevations from 5,000 to 7,000 feet above sea level, both of them leave Montana at about 2,000 feet elevation, having a fall within the state of from 3,000 to 5,000 feet. These great rivers are fed by innumerable mountain streams, which with their cascades and cataracts offer an almost illimitable opportunity for the cheap development of power. Conservative electrical experts have estimated that by the harnessing of merely the larger streams of the state more than 1,000,000 horsepower can be made available for the use of the growing industries.

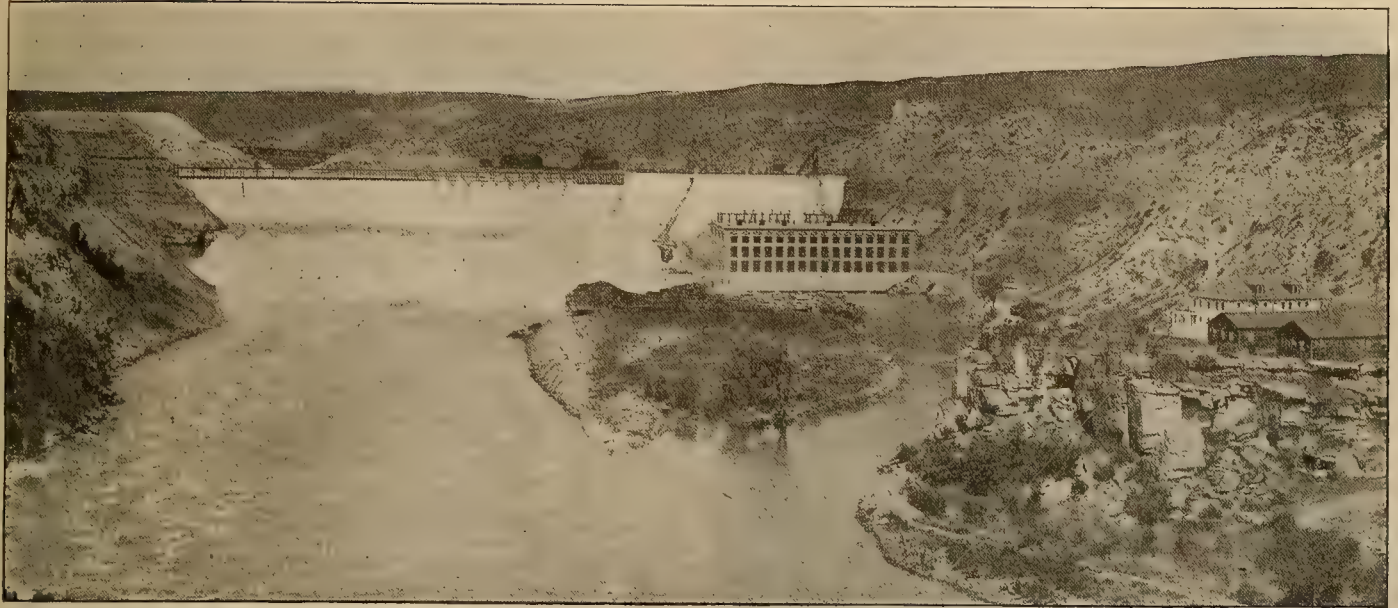
The main range of the Rocky Mountains divides Montana into two parts: the eastern section drained by the Missouri river and its tributaries; the western part drained by the tributaries of the Columbia, the Clark's Fork and the Kootenai rivers. An important tributary of the Clark's Fork river is the Flathead river, which drains Flathead lake. Upon all of these streams there are either large power plants or power sites waiting development.

### Transcontinental Electric Railroads

Montana was one of the pioneers in electrical development. Here was built one of the first long-distance, high-tension transmission lines in the world carrying 50,000 volts, and here electrical energy was first utilized for the handling of heavily loaded transcontinental freight trains.

The Butte, Anaconda & Pacific Railway, running from Butte to Anaconda, with 90 miles of electrified track, and carrying in addition to passenger business, heavy ore trains between the Butte mines and the Anaconda smelter, was the first successful at-





The dam and power house at Volta Station on the Montana Power Company's system. The installed capacity of the plant, which was completed in 1916, is 60,000 kw. The plant is located on the Missouri River at the Great Falls.

tempt to utilize electric power to replace steam locomotives for general railway traffic. The work of the Butte, Anaconda & Pacific was watched with interest by railway experts all over the world, and as soon as its success was demonstrated the Chicago, Milwaukee & St. Paul Railway let contracts for the electrification of its lines across the main ranges of the Rocky and Bitter Root mountains, a distance, from Harlow, Montana, to Avery, Idaho, of 440 miles. This work has been completed and the success of the undertaking has exceeded the expectations of its fondest promoters.

#### Cheap Power Over Mountains

It is apparent that it is a matter of but a very short time until all the transcontinental railways, especially in their mountain divisions, must turn to electric operation. In fact, it is a matter of common knowledge that other transcontinental systems are even now making provision for this inevitable change. Electrical operation not only has the advantage of making large savings in the expenses of operation by the elimination of fuel and the greatly reduced maintenance expense of electric locomotives as compared with steam locomotives, but also on account of the fact that with the increase in traffic, due to the rapid development of western and trans-Pacific business, the capacity of the whole line is limited by the tonnage which can be hauled over the steep mountain grade. Inasmuch as the electric locomotives used have a much greater continuous power capacity than any steam locomotives yet built, it follows that heavier trains can be handled over the steep grades at considerably increased speed and the tonnage hauled over the division increased accordingly, while to get a corresponding tonnage increase with steam operation would require double-tracking.

In addition to this, the electric locomotives will do away with the possibility of forest fires from locomotives in the mountains through which the trains pass.

#### Electrically Operated Mines and Smelters

The great copper and zinc mines of the Butte district and other metalliferous mines throughout the state are using electric power almost exclusively. A lessened cost of production has resulted, enabling many mines now to be operated at a profit which could not be worked with more expensive power.

In the application of electricity to extensive mining operations Montana has easily assumed first place, and the energy obtained from distant water powers is being conducted to remote localities, difficult of access, where it performs an infinite variety of work in a most economical and efficient manner. So satisfactory have been the results obtained that it has practically superseded steam power, and is now driving the enormous hoists, compressors, pumps, mills and other mechanical appliances used in the mining operations carried on at Butte and in the great smelters of the Anaconda Copper Mining Company at Anaconda and Great Falls, and that of the American Smelting and Refining Company at East Helena. The Anaconda Copper Mining Company is diversifying its business more and more, and is an ever increasing power consumer. In addition to the power required for copper mining and smelting it has recently become a large zinc producer, and about 35,000 kilowatts are used for producing zinc by the electrolytic process. The company has recently completed a rod and wire mill at Great Falls, and has installed electric furnaces for melting zinc and for the production of ferro manganese. This process will require 20,000 kilowatts.

The saving by the use of electrical power can be better comprehended when it is understood that the development of one horsepower by coal costs an average of about \$125, while electrical power is furnished to the mines at from \$35 to \$50 per horsepower year.

#### Power for Irrigation

Lifting waters by their own power is practically what is being done in the use of electricity for



irrigation purposes. Throughout the state there is much valuable land, the productive power of which can be greatly increased by irrigation. With the use of cheap electrical power for pumping, it is possible to put much of this land under water during the growing season, and the electrically operated reclamation projects throughout the state are an unqualified success. The largest of the reclamation plants of this character is in the Prickly Pear Valley, a few miles from Helena. Two large pumping plants for irrigation have been installed in this valley by the Montana Reservoir & Irrigation Company, which



Interior of the Rainbow Power House. This plant was enlarged in 1916, and now has an installed capacity of 35,000 kw.

secures its power from the Montana Power Company's Hauser Lake plant on the Missouri river. The Hauser Lake Dam forms a large artificial lake, from which the water is pumped to thousands of acres of adjacent farm lands. In this project, water for irrigation purposes is furnished at an exceptionally low rate, the contract price paid by the farmers being \$1.75 per acre foot.

The Montana legislature, called in extraordinary session during the summer of 1919, passed a law creating a Montana Irrigation Commission empowered to create irrigation districts. The drought of the last three summers has emphasized the need for irrigation in the state and many districts are now being organized. Intensive development under irrigation will build up a summer pumping load that was not thought possible a few years ago.

### Electricity in Cities

Approximately one-third of the earnings of the Montana Power Company are derived from lighting, heating and small power in fifty cities and towns in Montana. In addition to this, flour mills, electric street and interurban railways, cement plants, dredges, coal mines and numerous other industries consume a large amount of electrical energy.

The domestic water supply of many of the larger cities is pumped by electric power. Cooking by electricity is becoming very popular. Electrically driven sewing and washing machines are in every day use, and many other devices which tend to lighten the duties of the housewife.

### Companies in Operation

So far most of the greater development in Montana has been carried on by the Montana Power Company. There are many other companies operating in the state; a total of 124 cities and towns are supplied with electric service as reported to the Public Service Commission for 1919. The Montana Power Company was developed from a consolidation of the Butte Electric and Power Company, the Missouri River Electric and Power Company, the Great Falls Power Company and the Thompson Falls Power Company, although the two latter companies are separate corporate entities. The complete summary of the plants under this company is as follows:

#### COMPLETED HYDRO-ELECTRIC PLANTS

	Head (ft.)	Installed Capacity (Kw.)
Big Hole, on Big Hole River, completed 1898	65	3,000
Canyon Ferry, on Missouri River, completed 1898, enlarged 1901	40	7,500
Madison No. 1, on Madison River, completed 1901, remodeled 1907	55	2,000
Madison No. 2, on Madison River, completed 1906	110	10,000
Livingston, on Yellowstone River, completed 1906, enlarged 1908		1,500
Lewistown, on Spring Creek, completed 1906, remodeled 1913		450
Billings, on Yellowstone River, completed 1907		1,080
Rainbow, Rainbow Falls on Missouri River, completed 1910, enlarged 1916	112	35,000
Hauser Lake, on Missouri River, completed 1911, enlarged 1914	65	18,000
Black Eagle Falls, on Missouri River, reconstructed 1913	44	3,000
Thompson Falls, on Clark's Fork of Columbia River, completed 1916	50	30,000
Volta, on Missouri River at the Great Falls, completed 1916	150	60,000
Holter, on Missouri River, completed 1918	107	40,000

TOTAL..... 211,530

#### UNDEVELOPED SITES

	(Kw.)
Madison No. 3, on Madison River	20,000
Great Falls "C," on Missouri River, above Great Falls	28,500
Sheep Creek, on Missouri River, below Great Falls	28,500
Fish Creek, on Missouri River	13,500
Black Eagle, on Missouri River, reconstruction	10,000

TOTAL..... 100,500

#### STEAM PLANTS

	(Kw.)
Butte, completed 1907 (reserve)	5,000
Billings, completed 1906 (reserve)	560
Conrad, completed 1910 (electric soon to be extended)	110
Phoenix (Butte), completed 1895	250

TOTAL..... 5,920

### Transmission Lines

The transmission system of the company interconnects all of its power developments, with the exception of the Thompson Falls, and covers an area extending 260 miles from east to west and 300 miles from north to south. The various lines are tied together through transformers and operated as one complete network, into which power is fed from each of the plants, and from which power is taken by numerous sub-stations, varying in size from the Great Falls Power Company's sub-station at Butte, having a capacity of 21,000 kilowatts, down to the lowest standard high-voltage sub-station of 250 kilowatts. Almost 2,000 miles of transmission line are in operation, a considerable portion of which is steel tower line.

	Miles
Steel tower lines, 110,000 volts	341
Pole lines, suspension insulator type, 110,000 volts	400
Pole lines, suspension insulator type, 50,000 to 100,000-v.	632
Pole lines, pin type, 11,000 to 60,000 volts	549

Total, 1922

### Storage Reservoirs

The ideal generating system must have an even flow of water to its turbines, but this cannot be obtained if the natural flow of the river is depended upon. The low water stage of the river limits the output that can be marketed continuously. For this reason reservoirs are provided at each of the plants and in addition the great Hebgen reservoir has been



built on the Madison river, to control the supply on both the Madison and Missouri rivers. Each second foot of water released from this reservoir is utilized through the chain of eight great plants along the Missouri and develops 40 kilowatts. A summary of the reservoirs follows:

	Area, acres	Acre feet
Hebgen reservoir, on Madison river.....	13,400	322,000
Madison reservoir, on Madison river.....	4,030	21,000
Canyon Ferry reservoir, on Missouri river.....	4,570	36,000
Hauser Lake reservoir, on Missouri river.....	5,470	54,000
Big Hole reservoir, on Big Hole river.....	210	1,650
Rainbow reservoir, on Missouri river.....	120	1,000
Great Falls, on Missouri river.....	450	5,500
Thompson Falls, on Clark's Fork river.....	500	5,500
Holter reservoir, on Missouri river.....	5,005	89,000
Total,		535,650

**Operating Statistics  
The Montana Power Company  
Calendar Year 1919**

Generating Capacity .....	211,530 kw.
Maximum Load .....	152,800 kw.
Average Load .....	98,858 kw.
Power Generated .....	863,960,624 kw-hr.
Power Purchased .....	2,037,928 kw-hr.
Load Factor .....	65%
Sub-station Capacity .....	309,625 kw.
Sub-station Consumption .....	744,956,047 kw-hr.
Loss in Transmission .....	121,042,505 kw-hr.
Loss in Transmission .....	14%
Connected Load of Consumers .....	315,909 kw.
Consumption by Consumers .....	720,681,439 kw-hr.
Loss in Trans., Transformation & Distr'b... ..	145,317,113 kw-hr.
Loss in Trans., Transformation & Distr'b... ..	17%

## Water Power in the "Inland Empire"

(The great water powers of the Pacific Northwest constitute one of the principal factors in the rapid growth of that district. The following account of some of the large installations gives a good idea of the type of hydroelectric development which is forwarding the industrial activities of the region.—The Editor.)

The Inland Empire—that section of the Pacific Northwest lying within a 150-mile circle of Spokane—is said to possess one-sixth of the nation's water power, the estimated total running into millions of horsepower.

### Hydroelectric Plants

Electrical development in the Spokane district has centered about the unusual conditions existent in the Spokane river which in its 100 miles of turbulent career between Lake Coeur d'Alene and the Columbia river falls 1280 feet with a maximum flow of 40,000 second feet and a natural minimum of 1500 second feet. The lake constitutes a natural reservoir of 45 square miles in which six feet of water is conserved against low water period by dams at Post Falls and elsewhere above Spokane.

The demands upon the power furnished by the Spokane river are varied: The miner in the silver-lead and copper mines of the famous Coeur d'Alenes—which product one-third of the lead output of the United States—finds electricity economical in his work, and the treasure cities of the district, Wallace, Burke and Mace, are served by 60,000-volt lines running out of Spokane.

The Western farmer is alive to the value of water power and electricity supplies the many needs of the great wheat and apple sections to the south and west of Spokane. To the north and east, com-

Only a small portion of the available water power in Montana has been developed. In addition to the plants already built and in operation, there are a great number of large power sites and numberless smaller ones ready for development as soon as the demands for power increase and there is available capital for their construction. Although these possible developments are located in all parts of the state, the large possibilities exist in the northwest section of Montana, where the waters of the Flathead, the Kootenai river and other large streams will, when harnessed, furnish more than 500,000 horsepower. The power site at the mouth of the Flathead lake, which is one of the most feasible in the state, has been reserved by the Government in connection with the reclamation system covering a portion of what was formerly the Flathead Indian Reservation. A number of smaller power sites have also been reserved, while many others are under private ownership.

When the value of the coal is considered that is being saved each year by means of water power, and that during the next ten years this saving will, in all probability, be increased seven or eight times, it is not difficult to understand that true conservation consists in encouraging the rapid development of water power, which unless developed and utilized becomes lost for all time.

munities use the power for light and heat, and the lumber camps for power. In Spokane, industries and the street and interurban electric lines have been fostered by low-priced current and efficient service.

The Washington Water Power Company now has four hydroelectric plants: Post Falls, Little Falls, the Monroe Street city plant, and the recently completed Long Lake development, which boasts the highest spillway dam in the world, with 90,000 sec. ft. capacity. The Post Street sub-station is the distributing center for the power used in the city of Spokane, for lighting, heating and street and sub-urban railway lines.

The Spokane and Eastern Railway and Power Company has a 16,000-hp. capacity plant at Nine Mile on the river.

At the Washington Water Power Company's Post Falls plant east of Spokane, the river divides into three channels and in the middle channel is located the head gate dam and power house with five units installed at the present time, each unit consisting of a horizontal Francis central discharge, double-runner water wheel, operating under a head of 50 ft. The station has five outgoing lines, four of which are 60,000-volt and one 2300.

At the lower falls, in the heart of the city, is located the original hydroelectric station of the company. It operates under a head of 74 ft. and pro-



duces 8,800 hp. Two of the units consist of Francis turbines direct-connected to 2250-kw. a.c. generators, and the rest of the units are composed of water wheels and d.c. generators of various sizes ranging from 200 to 1200 kw.

The Post Street sub-station, also located in the heart of the city, distributes power from all four plants for city use with 30,000-kw. capacity.

The Little Falls station, 30 miles northwest of Spokane, contains four units, each consisting of a 9,000-hp. I. P. Morris horizontal twin turbine direct-connected to a 5,500-kw., three-phase, 60-cycle, 4,000-volt General Electric generator. The water wheels will develop a maximum of 11,250 hp. each when operated under a 73-ft. head running at 150 rev. per min. Each generator is guaranteed to operate continuously under a 25 per cent overload.

The Long Lake development is situated on the Spokane river about 24 miles northwest of the city. At this point the river makes a complete horseshoe bend and passes through a box canyon, the walls of which are of granite formation rising to a height of about 350 ft. above the water, making an ideal location for the highest spillway dam in existence, with the water station around the bend about 250 feet from the dam.

#### Drainage and Ventilating System

An elaborate and complete drainage system has been constructed, consisting of a network of drains on the foundation, which are connected by pipes to the inspection and drainage tunnels, which will relieve an upward pressure other than that due to back water that might exist. The ventilating system consists of four fans, each having a capacity of 50,000 cu. ft. per minute at  $1\frac{3}{4}$  oz. pressure. The head gates which, are 21 by 19 feet, are constructed of I beams and plates, and operated on wheels which travel on a vertical 60-lb. rail concreted in the face of the dam. The wheel axles are mounted on bronze eccentrics, which allow a forward movement of  $\frac{3}{4}$ -in. and to which rubber belting is fastened which acts as the seal and rests on the flange of an I beam concreted into the dam. When the gate is in closed position, it is held against the dam on the seals by the water pressure, making it absolutely water tight.

#### Long Lake Plant Equipment

The installation consists of four 13,900-kva. generators direct-connected to four 22,500-hp. turbines. The turbines are of the double inflow horizontal Francis type, manufactured by the I. P. Morris Company. Each unit consists of 83-inch twin runners enclosed in cast iron volt casings and operates at a speed of 200 r.p.m. under a 168-ft. effective head with a guaranteed efficiency at  $\frac{3}{4}$  load of 85 per cent.

On the second floor are the high tension oil switches, disconnecting switches, and high tension buses. Above this on the third floor are the lightning arresters, high tension current and potential transformers, line disconnecting switches with the choke coils in the open alcoves at line entrances. On the roof are placed the steel structures conveying

the lines to the horn gaps through the roof bushings to the lightning arresters below.

The station is designed with clearances for 110,000 volts through the disconnecting switches and high tension buses are the only parts of the equipment so insulated at this time. All 4,000-volt oil switches are motor-operated Type H-6. All 70,000-volt oil switches are solenoid-operated Type K-15. All 110,000-volt oil switches are Type F. K.-36. The arrangement of oil switches in the circuits is such as to give a liberal degree of flexibility in operation, facilities, re-arrangement in case of a breakdown of one of the oil switches, and allow disconnecting any one of them for repairs without shutting down any generator, transformer or line. The synchronizing equipment is installed in duplicate and allows synchronizing between generators, any generator to any line, or between lines.

#### Demand and Supply

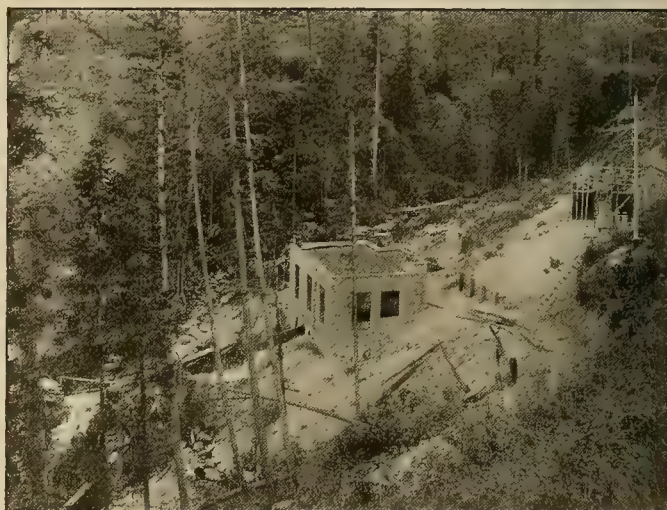
The company will start construction very soon of a high power transmission line from the Long Lake plant to Chewelah, for service to the magnesite quarries and mining properties in the district.

The line, carrying 5,000 horsepower, will be about 35 miles long and will connect with the power line of the Stevens County Light and Power Company, the plant of which is insufficient to take care of the rapidly growing needs of the district.

The total developed horsepower in the Inland Empire territory is as follows:

		Hp.
Washington Water Power Co.	Post Falls	15,000
Washington Water Power Co.	City Plant	12,000
Washington Water Power Co.	Little Falls	36,000
Washington Water Power Co.	Long Lake	90,000
City of Spokane	Up-River	3,000
Spokane & Eastern Ry. & Power	Nine Mile	16,000
Montana Power Co.	Thompson Falls	50,000
Similkameen River		5,000
Metaline Falls		6,000
Miscellaneous		6,000

Total horsepower, 239,000



MISSION RANGE POWER HOUSE

Power house of the Mission Range Power Company, located on Big Creek in Montana. The power house installation consists of two 200-kva. generators which supply power to the town of Polson. The current is generated at 2300 volts and transmitted to the town, a distance of six miles, at 16,500 volts.



# Hydroelectric Development in Southern California

BY W. A. BRACKENRIDGE

(The following masterly description of the hydroelectric possibilities of Big Creek and the upper San Joaquin River by W. A. Brackenridge, Senior Vice-President of the Southern California Edison Company, tells of the detailed plans worked out by that company for the exploitation of these streams in the high Sierras. This one California stream system has power possibilities exceeding those of any state outside of the Western states, excepting New York. —The Editor.)

The territory served by the Southern California Edison Company is still young in terms of power load. The demand for power during the last decade has more than doubled. The present offers load of all classes in magnitudes that tax our ability to construct plants to supply it. One million acres of land await the electric driven pump to bring them into cultivation and production, representing a possible load of 300,000 horsepower. Industry from the East and Middle West is just beginning to be attracted to Southern California by her natural advantages, market accessibility, and power resources. The electrification of certain railroads of Southern California is being brought closer to realization by the diminishing supply and increased price of fuel oil, and by the necessity for a more intense movement of traffic over natural channels of transportation. Without an adequate supply of electric power continuously available, the future growth of the country will be seriously retarded.

The responsibility to supply this power naturally falls to the Southern California Edison Company by reason of its position in the field. In accepting this responsibility the Southern California Edison Company has projected into the future a construction program which began actively to be executed immediately after the armistice. The program, while extensive, is at the same time flexible to permit of minor modifications to meet the varying needs of the time. Its execution will require the expenditure for new construction of ten million (\$10,000,000) dollars per year for the next ten years. This vast amount of money will be invested in hydroelectric developments to keep pace with the demands for power.

Investment in hydroelectric properties of this class is especially attractive because of its stability and its freedom from the effects of fluctuations in the fuel market.

For its future supply of hydroelectric energy, the Southern California Edison Company looks mainly to the San Joaquin River. The Kern River offers some future developments, but they are not comparable, either in magnitude, or in facilities for water storage, with the possible power developments of the San Joaquin River.

The present developments of the Edison Company on the San Joaquin River consist of Huntington Lake reservoir with

a storage capacity of 88,400 acre feet at an elevation of approximately 7000 feet, supplying Big Creek Power Houses Nos. 1 and 2, each with an installed capacity of 32,000 kw., operating under static heads of 2130 feet and 1860 feet respectively. These developments form only the nucleus of the ultimate development possibilities, which will aggregate 868,000 horsepower.

The general scheme for developing this great source of hydroelectric power consists of the construction of a chain of power houses in series between Huntington Lake with an elevation of 7000 feet, and the tail water of Big Creek Power House No. 4 at an elevation of 1000 feet, giving an overall static head in excess of



Huntington Lake Reservoir at an elevation of 7000 feet, and with a storage capacity of 88,400 acre feet, supplies Big Creek Power House Nos. 1 and 2, each with an installed capacity of 32,000 kw.

one mile, through which the falling waters from Huntington Lake will be converted to useful power. This chain of power houses in the order of their location, beginning at Huntington Lake, will consist of Power Houses Nos. 1, 2, 3, and 4. The upper end of this chain of power houses has two branches, one leading from Huntington Lake through Power House No. 1, and the other from Huntington Lake through another power house designated at Power House No. 5, which will be located at an elevation approximately 500 feet above Power House No. 1. The tail water from Power House No. 5 will discharge through a tunnel line into Shaver Lake, from whence it will ultimately be conducted through Power house No. 2 and the remainder of the power



houses in the chain. This development plan will make the waters of Shaver Lake, with an ultimate reservoir capacity of 146,000 acre feet, at an elevation of 5400 feet, available for use through all of the plants of the chain of power houses, except Power House No. 1.

Additional Sites

In addition to this chain of power houses using the stored waters of Huntington Lake and Shaver Lake, two other power sites, not using the waters from Huntington and Shaver Lakes, will be developed. One of these power sites, designated as Power House No. 7, located on the middle fork of the San Joaquin River, offers an ultimate development of

static heads, installed horsepower, and annual output in kilowatt-hours.

TABLE NO. 1  
BIG CREEK POWER PROJECT  
ULTIMATE DEVELOPMENTS

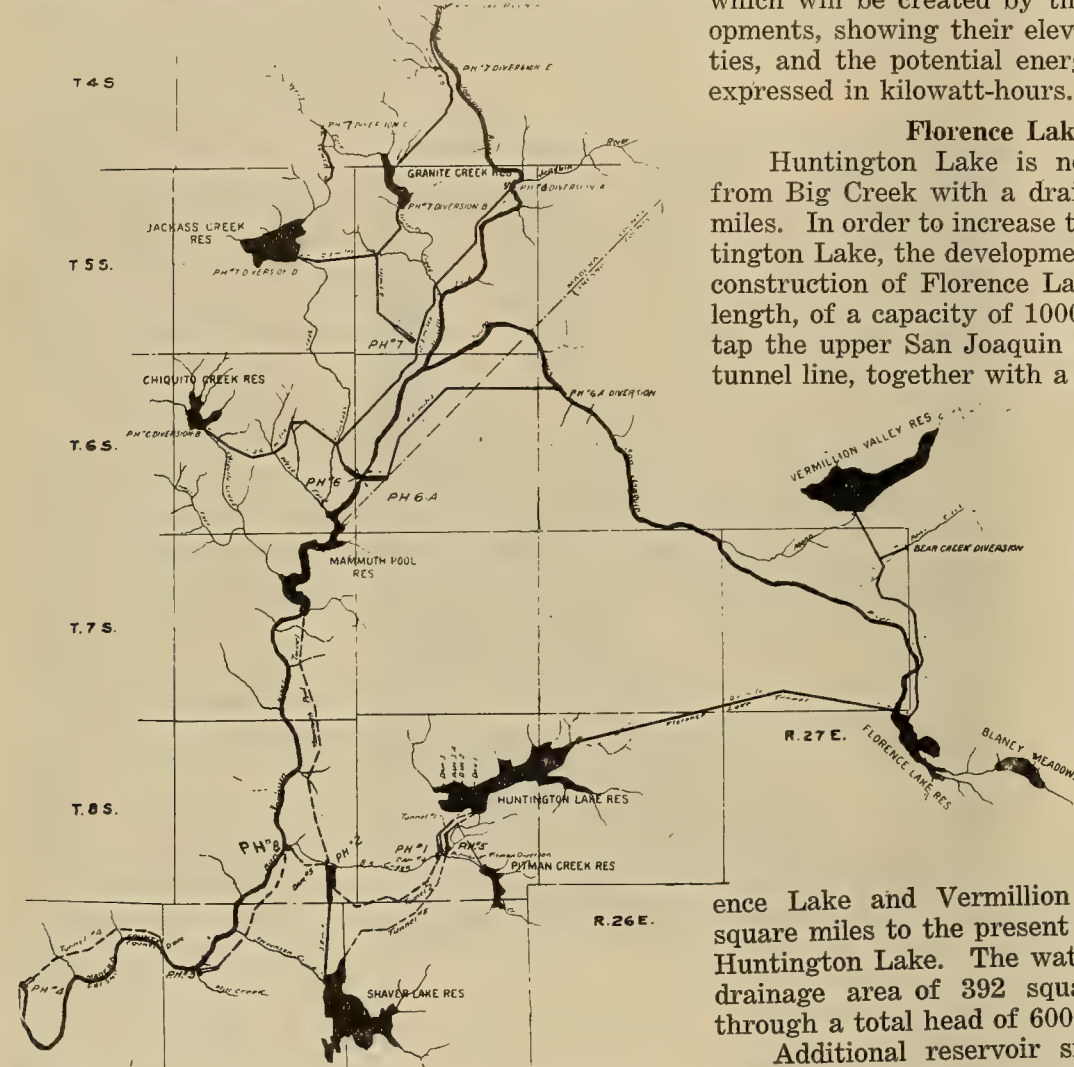
Plant	Static Head feet	Installed Hp.	Annual Output Kw. hr.
Power House No. 1	2,130	86,000	353,000,000
Power House No. 2		193,000	855,000,000
Huntington Lake Water	1,860		
Shaver Lake Water	2,400		
Power House No. 3	825	120,000	525,000,000
Power House No. 4	380	54,000	250,000,000
Power House No. 5	1,480	108,000	291,000,000
Power House No. 6	1,650	147,000	590,000,000
Power House No. 7	1,900	40,000	148,000,000
Power House No. 8	717	120,000	525,000,000

TOTAL..... 868,000 3,537,000,000  
NOTE.—Power Houses Nos. 1 and 2 have been in operation since 1913, each with a capacity of 32,000 kw.

Table No. 2 gives a list of the storage reservoirs which will be created by the ultimate power developments, showing their elevations, acre feet capacities, and the potential energy represented thereby, expressed in kilowatt-hours.

Florence Lake Tunnel

Huntington Lake is now supplied exclusively from Big Creek with a drainage area of 79 square miles. In order to increase the water supply to Huntington Lake, the development program included the construction of Florence Lake tunnel, 10.5 miles in length, of a capacity of 1000 second feet, which will tap the upper San Joaquin at Florence Lake. This tunnel line, together with a ditch line between Flor-



This map, taken in connection with the cut of the development on page 504, shows the general conditions attending the Big Creek development. The fact that the south fork of the San Joaquin river swings around in a great bend to the north explains how the waters from the upper reaches may be used at such high heads.

40,000 horsepower under a head of 1900 feet. The other, known as Power House No. 6, is located on the main San Joaquin River above its junction with Big Creek, and is capable of a development of 147,000 hp. at a head of 1650 feet.

The entire plan of ultimate power development is shown on the accompanying map of the San Joaquin River and its tributaries.

The principal hydraulic features of the project are shown in schematic form in the vertical projection of the territory showing the tunnel lines, pressure pipe lines, reservoirs, and power plants.

Table No. 1 gives in tabulated form a list of all the power houses included in the project with their

ence Lake and Vermillion Valley, will add 312.7 square miles to the present drainage area supplying Huntington Lake. The water yield from the entire drainage area of 392 square miles will be used through a total head of 6000 feet.

Additional reservoir sites on the Upper San Joaquin above Huntington Lake will be developed to an aggregate capacity of 145,000 acre feet at Florence Lake, Vermillion Valley, and Blaney Meadows, and their stored water diverted through Florence Lake tunnel into Huntington Lake for use

TABLE NO. 2  
BIG CREEK POWER PROJECT  
STORAGE RESERVOIRS  
ULTIMATE DEVELOPMENT

	Elevation	Acre Feet Capacity	Equivalent kw. hr. yield through all Power Houses
Vermillion Valley	7,500	90,000	396,000,000
Florence Lake	7,300	40,000	176,000,000
Blaney Meadows	7,500	15,000	66,000,000
Huntington Lake	6,950	88,000	388,000,000
Shaver Lake	5,370	146,000	455,000,000
Granite Creek Reservoir	6,980	22,000	89,000,000
Jackass Creek Reservoir	7,000	27,000	109,000,000
Chiquito Creek Reservoir	5,000	18,000	47,000,000
Mammoth Pool Reservoir	3,000	28,000	37,000,000

TOTAL..... 474,000 1,763,000,000



through the entire chain of power houses below Huntington Lake.

The completion of this project will make available for use through the chain of power houses between Huntington Lake and the tail water of Power House No. 4, additional hydroelectric energy amount-



The long distance high voltage transmission lines on the Southern California Edison Company's Big Creek system extend a distance of 241 miles and operate at 150,000 volts. These were the first commercial transmission lines in the world to be operated at a potential as high as this.

ing to 1,400,000,000 kw-hr., also reservoir control over this energy through Power Houses Nos. 1, 2, 3, 4, 5, and 8.

#### Shaver Lake

Shaver Lake is located below Huntington Lake at an elevation of 5400 feet on the south side of Big Creek Canyon, and directly south of Big Creek Power House No. 2, a distance of 3.8 miles. Its ultimate development will create a storage reservoir with a capacity of 146,000 acre feet. The drainage area naturally draining into Shaver Lake is 31.9 square miles. Shaver Lake will be used in connection with the Big Creek power system by connecting it through Power House No. 5 to Huntington Lake, requiring a tunnel line 5.75 miles in length through solid rock, with a capacity of 1000 second feet. Power House No. 5 will be developed to an ultimate capacity of 108,000 hp. under a head of 1480 feet.

At such times as the flood waters coming through Florence Lake tunnel from the head waters of the San Joaquin river are beyond the capacity of Huntington Lake to store them, Power House No. 5 and the tunnel therefrom to Shaver Lake will be used to conduct the waters into Shaver Lake, where they will be stored until the most economical use can be made of them for power development through Power Houses Nos. 2, 8, 3, and 4.

During a year of excessive precipitation, Shaver Lake reservoir will serve as a storage medium in which to conserve the flood waters of sub-normal precipitation.

From Shaver Lake a tunnel line 2.6 miles in length with a capacity of 600 second feet will conduct the waters to the penstocks of Big Creek No. 2, where they will again enter the conduits leading through the chain of power houses, beginning at Big Creek No. 2 and continuing through Power Houses Nos. 8, 3, and 4.

#### Pitman Creek

Pitman Creek waters at the present time enter the Big Creek system at the tail water of Big Creek Plant No. 1 and are utilized through Big Creek Power House No. 2, where they produce an average of 30,000,000 kw-hr. per year.

The waters of Pitman Creek, as at present utilized, are not capable of being stored to a limited degree in the small reservoir which receives the tail water from Big Creek Plant No. 1 and forms the intake to the tunnel line leading to Big Creek No. 2.

These waters, after discharging from Big Creek No. 2, will be used through additional Power Houses Nos. 8, 3, and 4, to be constructed below Power House No. 2, through which they will produce an average of 28,000,000 kw-hr. per year.

For the purpose of securing reservoir control over these waters and also to make available from them an additional 30,000,000 kw-hr. per year by using them also through Power House No. 1, one phase of the future developments includes the construction of a diversion dam on Pitman Creek at an elevation which will permit the diversion of the Pitman Creek waters into Huntington Lake, where they will be subject to reservoir control and will in addition be available for use through Power House No. 1.

#### Mammoth Pool Tunnel

Without the construction of Mammoth Pool Tunnel, the waters of the Main San Joaquin River will not join the waters from Huntington Lake and Shaver Lake until the tail waters of Big Creek No.

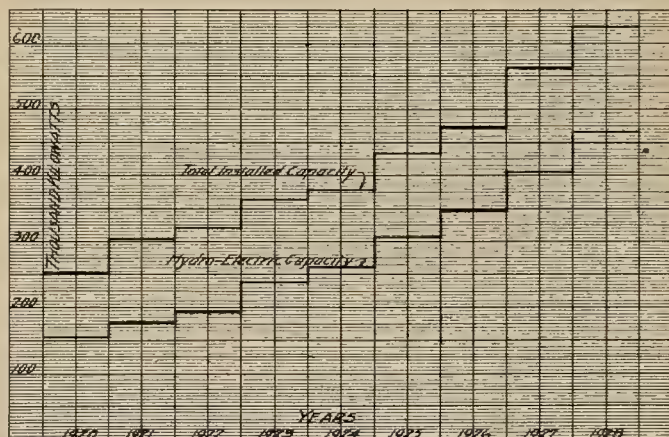


Chart of system capacity. The new developments being undertaken by the Company will supply a constantly increasing demand for power.

8 are reached, beyond which point they will be used jointly with the discharge from Big Creek No. 8 through Power Houses Nos. 3 and 4, but not through Power House No. 8.

The waters of the Main San Joaquin River can be made to do work through Power House No. 8 also by the construction of Mammoth Pool Tunnel. This project consists of the construction of a diversion dam on the main San Joaquin River at an elevation slightly above the tail water of Big Creek No. 2 plant, and the construction of a tunnel therefrom through solid rock a distance of 9.5 miles and of 1000 second feet capacity, to the tail water of Big Creek No. 2. From this point the waters will enter



the tunnel lines to Big Creek No. 8 and will be used through plants Nos. 8, 3, and 4. The construction of the tunnel will make possible the additional production in Power House No. 8 of 252,000,000 kw-hr.

In addition to the increased energy output by the utilization of the main river through Plant No. 8, there will be created on the main river back of the diversion dam a storage reservoir which will have a beneficial value from a regulation standpoint, in that it will permit of a greater flexibility in handling peak loads.

The general plan to bring into production the power resources on the San Joaquin River is:

- 1st. Complete the utilization of water from Big Creek and Pitman Creek through Power Houses Nos. 1 and 2, up to an installation of three units in each power house.
- 2nd. Develop the storage possibilities on Shaver Lake and construct a conduit therefrom to Power House No. 2 to augment the water supply from Big Creek and Pitman Creek.
- 3rd. Construct Power House Nos. 2, 3, and 4 in succession up to a development of two or three units in each power house.
- 4th. Construct Florence Lake Tunnel and divert the waters of the Upper San Joaquin River into Huntington Lake.
- 5th. Complete Mammoth Pool Tunnel and divert the main San Joaquin River through Power House No. 8.
- 6th. Develop the water resources north of Mammoth Pool on the San Joaquin River and tributaries through Power House Nos. 6 and 7.

The probable rate at which these power developments will be made is shown on Table No. 3, which is the generation program for the decade 1920-30, which the Southern California Edison Company expects to find necessary to carry through to satisfy the growing demands for power in its territory.

### Transmission Voltage

Energy is transmitted from the present Big Creek power plants to Los Angeles, a distance of 241 miles, over two aluminum steel core circuits. Each circuit is carried on a separate steel tower line and is operated at 150,000 volts.

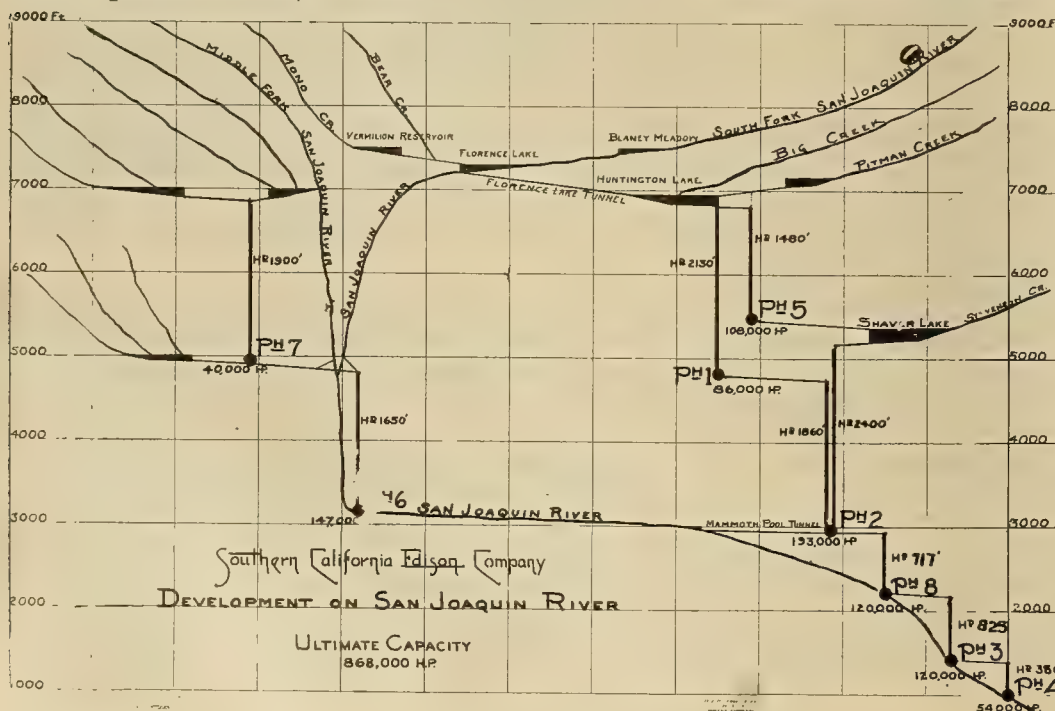
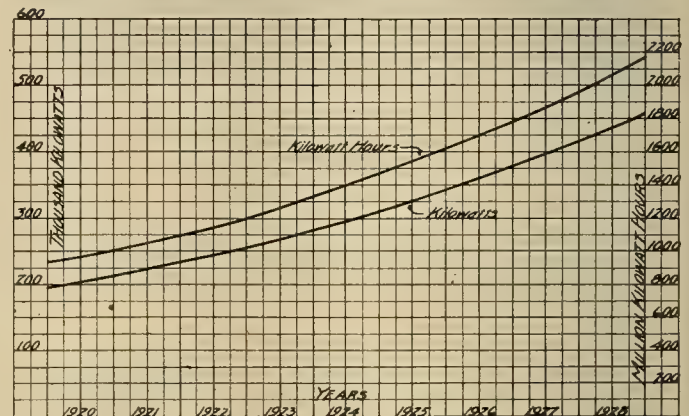


TABLE NO. 3  
GENERATION PROGRAM  
PERIOD 1920-1930

Year		Kw. Hydro	Kw. Steam
1920	Additions to Big Creek Power House No. 2....	16,000	.....
1920	Kern No. 3.....	30,000	.....
1921	Long Beach No. 4.....	.....	30,000
1921	Big Creek Power House No. 8.....	22,500	.....
1922	Additions to Big Creek Power House No. 1....	16,000	.....
1923	Big Creek Power House No. 3.....	45,000	.....
1924	Big Creek Power House No. 3.....	22,500	.....
1925	Big Creek Power House No. 4.....	40,000	.....
1926	Big Creek Power House No. 5.....	20,000	.....
1926	Additions to Big Creek Power House No. 2....	20,000	.....
1927	Additions to Big Creek Plants.....	60,000	.....
1927	Additions to Steam Plants.....	.....	30,000
1928	Additions to Big Creek Plants.....	60,000	.....
1929	Additions to Big Creek Plants.....	60,000	.....
1930	Additions to Big Creek Plants.....	60,000	.....
Probable additions within period.....		472,000	60,000

These were the first commercial transmission lines in the world to be operated at a potential as high as 150,000 volts. Their operation has been singularly free from trouble, so much so that plans are now under way to convert them for operation at 220,000 volts. Their capacity to transmit load will



be doubled by this change and the necessity of immediately constructing additional lines to transmit the production of new plants being brought in will not have to be made until a later date. The higher voltage not only has the advantage of requiring a smaller investment per unit of load transmitted, but is also more economical to operate.

Plan of a chain of power houses on the San Joaquin River and its tributaries planned by the Southern California Edison Company. The overall static head on this system is in excess of one mile, and the ultimate installed capacity, 868,000 hp.



Each line, when converted to 220,000 volts, will be capable of transmitting 100,000 kw., giving a total capacity for the two existing lines of 200,000 kw.

To secure the same capacity by the construction of additional 150,000-volt transmission lines would require an investment of \$10,000,000 in excess of the cost of converting the present lines from 150,000 to 220,000 volts. The conversion will, therefore, effect a saving in investment of the amount for the present increase in load carrying capacity, and a corresponding amount for future transmission line requirements.

Kern River Developments

In addition to the Big Creek power project, the Southern California Edison Company has located power sites on the Kern River, where it now has in operation two plants, Kern River No. 1 with an

installation of 20,000 kw., and the Borel Plant with an installation of 10,000 kw.

Farther up the Kern River above Borel three additional power sites have been located, which have been designated as Kern No. 3, Kern No. 4 and Kern No. 5. The Kern No. 3 plant is now under construction and is expected to be in operation by the end of this year.

The effective heads, the installed horsepower which it is expected will be made, and the output in kilowatt-hours for these three plants, is given in Table No. 4.

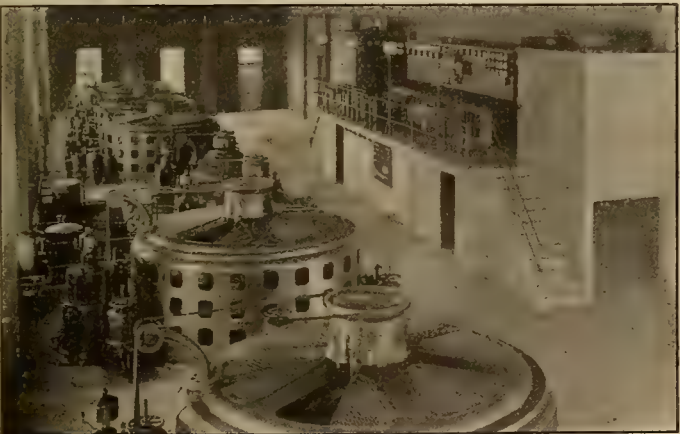
TABLE NO. 4  
KERN RIVER PROJECT  
ULTIMATE DEVELOPMENT

	Eff. Head Feet	Installed H. P.	Annual Output Kw. hr.
Kern River No. 3 .....	860	40,000	180,000,000
Kern River No. 4 .....	850	40,000	175,000,000
Kern River No. 5 .....	1,350	40,000	175,000,000
TOTAL .....		120,000	530,000,000

Electrical Development on the Salt River Project

(Electric pumping is one of the increasingly important loads of the West, and the part which it plays in modern agriculture is evidenced by the frequent development of power systems in connection with irrigation projects. A large-scale example of this is described in the following interesting account of the power plants on the Salt River project, developed by the U. S. Reclamation Service.—The Editor.)

The Salt River project is primarily an irrigation agricultural project. Irrigation was practiced in this valley for some years previous, the success obtained being only partial, due to inadequate facility to utilize the many possibilities.



The Cross Cut power plant has six generators and two exciters. The switchboard and controlling device consist of a 14-panel bench board and a 3-panel direct current board, mounted on a raised reinforced concrete platform.

The Reclamation Service, under the Reclamation Act, constructed on the Salt River an impounding dam capable of storing nearly 2,500,000 acre feet of water together with the necessary diversion dams, canals and distributing laterals for approximately 230,000 acres.

To facilitate the construction of a storage dam, a temporary power plant was constructed at what is now the site of the main power plant located at the Roosevelt Dam. Hydraulic power for operating this plant was obtained by diverting the water from the Salt river into a power canal of some 20 miles in length conveyed to a point on the bluff above the power site, and from that point to hydraulic turbines

by means of a penstock. This plant was the start of the present power system on the Salt River project. It was intended that the power generated would be utilized principally in pumping water in the valley for agricultural purposes. The phenomenal growth of the Salt River Valley made it necessary to utilize other power sites along the main canals in order that the demand for power could be met.

This power system in connection with the entire irrigation system of the Salt River project is being operated by the Salt River Valley Water Users' Association. The total of the entire generating capacity, consisting of 19,000 kw., is hydraulic.

The power is used in the city of Phoenix and seven smaller towns located within the Salt River Valley, and two of the largest mining companies use it for mining and mill purposes. The Salt River project makes use of the other portion of the power



Cross Cut Power House on the Salt River project. This plant operates under a head of 119 feet with a maximum flow of 750 second feet and is constructed with a special reinforced concrete forebay and two reinforced concrete penstocks 2240 feet in length.



for construction work and operating about sixty pumping plants that are being used for the combined purposes of developing water for irrigation purposes and maintaining a low water plane under the cultivated lands to prevent these becoming water-logged.

#### The Roosevelt Power Plant

The Roosevelt Power Plant is located at the toe of the Roosevelt Dam and consists of six units with a total capacity of 10,000 kw. These units are of the vertical type with generators mounted on the turbine housings. The water supply is received from the lake created by the dam, conveyed through the dam by means of two penstocks. One penstock is 10 feet in diameter and has its upper end 80 feet above the river bed. The other is 7 feet in diameter and leaves the dam at river level. Variable head turbines are used and so arranged as to utilize any head between 0 and 225 feet according to the height of water in the lake. The turbines are governed by 5 Lombard and 1 Woodward oil pressure governors. The governors are 2300 volts and 25-cycle.

Control is from a bench board and all switches are remote electrically operated. At the transformer house, 700 ft. distant, are located six 1050-kva. banks of 2300/45,000-volt transformers which connect with the lines to Salt River Valley and Miami, the latter place being the mining district.

#### The South Consolidated Power Plant

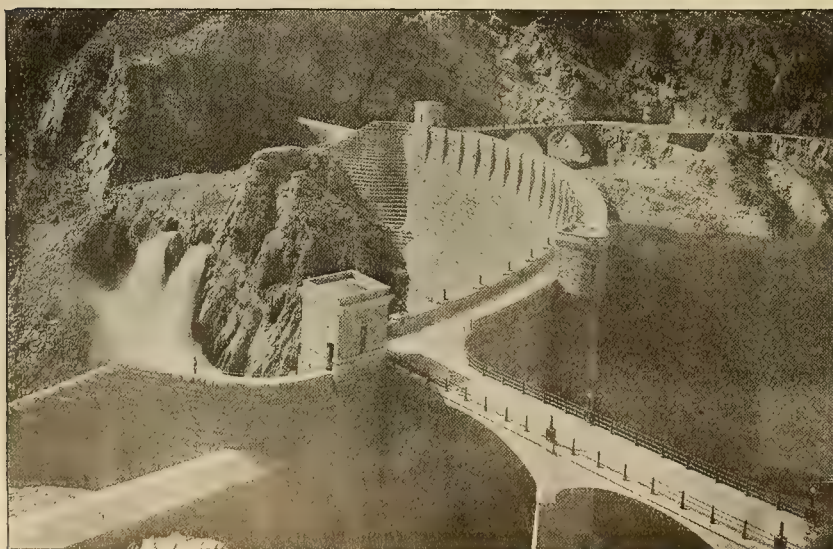
The South Consolidated Power Plant is located on one of the main irrigation canals at a point where there is available a head of 31 feet. The amount of water delivered to this power plant varies with the irrigation demand, reaching a maximum of 1250 second feet. The installation consists of two open flume type S. Morgan Smith, double runner, horizontal, single discharge turbines 1400 hp. each, direct connected to two 2300-volt, 1000-kva. generators. The generators are controlled from a switchboard of usual design with manually operated oil switches. Two banks of transformers step up this current from 2300 volts to 45,000 volts and is then transmitted a distance of about eight miles where it is connected to the main line from the Roosevelt Power Plant to Phoenix.

#### The Cross Cut Power Plant

The Cross Cut plant offers more features of interest to engineers, probably, than any other part of the system. It was required that a plant be designed to operate under a head of 119 feet with a maximum flow of 750 second feet. It was further desired that high efficiency be obtained at varying heads and that the flow of water be not impeded, as the water which passes through this power plant is utilized for irrigation purposes and the flow must not depend upon the load changes on the plant. To meet these conditions the design included a reinforced forebay from which two reinforced concrete penstocks 7 feet in diameter, approximately 2240 feet in length, led to the power plant. The plant has six generators and two exciters; three generators and one exciter being connected with each penstock.

Each unit consists of a Pelton vertical impulse turbine. The water is delivered to each wheel through six nozzles which are in turn controlled by individual needle valves. Direct connected to the turbine shaft is an 875-kva. Westinghouse, 25-cycle, 11,000-volt generator. The rotating elements of both the water wheels and generators are carried on Kingsbury thrust bearings located on top of the generator spiders. One exciter is used to furnish the excitation of three units and consists of a 300-hp. Pelton water wheel similar to the above described turbine, and a 250-kw. 110-volt direct current generator. When a unit is in operation all of the nozzles are wide open. The water applied to the wheel is controlled by means of stream deflectors operated by oil pressure governors of Pelton-Doble make. The official acceptance efficiency test made after the completion of this plant showed a maximum over all efficiency of 79.26%.

The switchboard and controlling device consists of a 14-panel bench board and a 3-panel direct current board, all of which are mounted on a raised reinforced concrete platform located about the middle of the generating room along the unused wall. The switch gallery and bus bar rooms are connected with, but separated by a wall, from the main generating room. It consists of a 11,000-volt room on the ground floor and a 44,000-volt room directly



The power plant located at the toe of the Roosevelt Dam receives its water supply through two penstocks, one ten feet, the other seven feet in diameter. There are six units with a total capacity of 100,000 kilowatts.



above. Parallel busses and necessary switching devices provide for both the 11,000 and 44,000 volts. Part of the current generated at this plant is transmitted over the 11,000-volt distributing system and part is stepped up by means of four banks of transformers, each bank consisting of three 500-kva. single-phase transformers. All the switches are electrically operated automatic oil circuit breakers, remote controlled from the bench board located in the generating room.

### The Chandler Power Plant

The Chandler plant is located on what is known as the Tempe Cross Cut Canal, situated about two miles north and west of Mesa, and operates under a 40-ft. head with a maximum flow of about 300 second feet of water. The plant consists of one S. Morgan Smith double runner, single discharge, flume type, horizontal turbine, direct connected to a 600-kva. General Electric 2300-volt induction generator. The power delivered from this unit is stepped up to 11,000 volts and fed into the 11,000-volt distributing system. This plant requires very little attention and operates equally as successfully as the other plants on the system.

The distributing system consists of 45,000 and 11,000-volt lines, there being 162 miles of 45,000-volt line connecting Roosevelt Power Plant and the Inspiration Consolidated Copper Company's mines and mills located at Miami, Arizona, and a line connecting the Roosevelt Power Plant with the valley plants and the city of Phoenix. The greater part of this line is carried on steel towers designed to use suspension type insulators, double three-phase circuit with a ground wire over each circuit. The branch line feeding from the main steel tower line to the Magma Copper Company, a distance of 30 miles, is single circuit pin type insulators carried on wood poles. The 11,000-volt distributing system consists of about 81 miles of single circuit, three-phase lines mounted on both wood and steel poles. This system is used primarily to supply power to the various pumping plants operated by the Association.

### The Arizona Falls Power Plant

The Arizona Falls plant is located on the Arizona Canal about 20 miles below a point where water is diverted from the river into the canal system and about 10 miles from the city of Phoenix. Except for being smaller in capacity this plant is a duplicate of the South Consolidated plant. This plant is also constructed across an irrigation canal and operates under a head of approximately 19 ft. The installation consists of two 725-hp. S. Morgan Smith open flume, horizontal type turbines, each direct connected to a 425-kw., 11,000-volt generator.

### Future Plans

As a large part of the power available on this project is dependent upon water being required for irrigation purposes it has been necessary to favor customers whose power requirements would be consistent with the irrigation season. This condition fits in very favorably with the requirements throughout the valley as a large acreage of land is available that is using this power for pumping purposes during

the irrigation season, resulting in maintaining a daily load factor unusually high, often reaching 90% and averaging 80%. This is made possible because mines using this power operate 24 hours a day and irrigation is carried on continuously throughout the entire irrigation season.

It is the intention of the Association to extend its distributing system throughout the entire Salt River project consisting of 230,000 acres, to supply electric power for domestic and ranch purposes. Electricity on the farm has been a subject much discussed but has not been extensively carried out in many localities. This project affords most favorable opportunities to put this plan in operation and it is hoped that many of the intricate problems arising through this plan will be worked out in such a way that other communities can receive the benefit of the experience gained on the Salt River project.

## CONSTRUCTION UNDER WAY IN CALIFORNIA

At the present time there are under way, contracts let or the machinery ordered for steam and hydroelectric installations in California that amount to 273,000 kilowatts. The following list gives the location of the project, type, probable date of completion and estimated capacity.

### NORTHERN CALIFORNIA

	Kilowatts
<b>Great Western Power Company:</b>	
Caribou Power House, North Fork, Feather River; completed March, 1921; hydro.....	40,000
<b>Pacific Gas and Electric Company:</b>	
Oakland; November, 1920; steam.....	12,500
Pit River; January, 1921; hydro.....	24,000
<b>San Joaquin Light &amp; Power Corporation:</b>	
Bakersfield; June 1, 1920; steam.....	12,500
Elk Hill; January 1, 1921; gas burning steam.....	12,500
Kerckhoff, San Joaquin River; Oct., 1920; hydro	30,000
<b>Southern California Edison Company:</b>	
Big Creek No. 2; November, 1920; hydro.....	16,500
Big Creek No. 8; March 1, 1921; hydro.....	22,500
Northern California total,	170,500

### SOUTHERN CALIFORNIA

<b>Southern California Edison Company:</b>	
Kern River No. 3; November, 1920; hydro.....	30,000
Long Beach; February, 1921; steam.....	30,000
<b>City of Los Angeles:</b>	
San Francisco Creek; July, 1920; hydro.....	20,000
<b>Los Angeles Gas and Electric Corporation:</b>	
Los Angeles; January, 1921; steam.....	10,000
<b>Southern Sierras Power Company:</b>	
Adams Power House; January, 1921; hydro.....	2,500
Lavining Power House; October, 1921; hydro.....	10,000
Southern California total.....	102,500
Total Hydro Installations,	195,500
Total Steam Installations	77,500
Total,	273,000

As has been pointed out, the majority of these plants will not be finished in time to help out the present shortage of power, but they will prevent a recurrence of this situation for the next few years. The construction program of the power companies, not including the above plants, is great enough to allow them to keep ahead of the increased demand unless there is an unusual growth in the uses of electricity in the next decade. In the next eight years California's peak is expected to reach 1,475,990 kw., and to meet this plans have been made to install 978,050 kw. additional, bringing the total installed capacity of California power plants to 1,925,150 kw.



# Economies in a Modern Steam Power Plant

BY EDWIN A. ROGERS

(The equipment and practical operation of a power plant are susceptible of a number of adaptations in securing the highest possible efficiency under a certain set of conditions. The following article gives some of the technical details of a modern plant in the Southwest. The author has been chief engineer in charge of the plant for two years.—The Editor.)

The power plant of the New Cornelia Copper Company at Ajo, Arizona, has already been described in connection with other modern steam power plants in this state, and some data given as to economies obtained.\* It is the intention to give in this article additional data on these economies and methods of operation used in obtaining them.

## Type of Equipment

The generating equipment consists of two General Electric turbo-generators rated at 7500 kilowatts at 80% power factor. The generators are 3-phase, 60-cycle, 2300-volts at 1800 r.p.m. The turbines are designed to use steam at 240 pounds pressure and 140 degrees superheat.

The condensing equipment consists of Wheeler surface condensers, Wheeler dry vacuum and centrifugal hot well pumps. Duplicate hot well pumps, one motor driven and one turbine driven, are provided for each condenser. Each condenser has its own motor-driven centrifugal circulating water pump for supplying the cooling water from the pond.

The boiler equipment consists of five Stirling boilers rated at 825 hp. each. They are operated at a pressure of 255 pounds and as normally operated deliver steam at 110 degrees superheat. Being equipped with asbestos insulation and steel casings, radiation and air infiltration losses are reduced to a minimum. The gases leaving the boilers pass through Green fuel economizers which are arranged so that with four boilers in operation, each economizer takes care of two boilers. Natural draft is used and as the air temperatures are

high in summer, a stack 220 feet high is necessary. This stack is of reinforced concrete, double for part of its height, and the tapered construction gives not only good mechanical proportions but a pleasing appearance.

Feed water heaters are provided which utilize the steam from the rotative dry vacuum pumps and feed water pumps to heat the feed water before it goes to the economizers. The pumps for handling the feed water are turbine driven centrifugals, the exhaust steam from the turbine going to the feed heater.

## Boiler Efficiency

The firing of the boilers is controlled by a Moore automatic regulating system which is one of the main contributing factors in the maintaining of the high boiler efficiencies obtained at this plant. The furnaces are of the Hammel-Peabody type and Hammel oil burners are used. That the automatic control of the dampers produces excellent results is shown by the boiler efficiencies maintained. With the dampers properly set the regulator maintains a draft condition which gives almost perfect combustion as shown by the gas analyzer, the per cent of CO<sub>2</sub> in

the gases leaving the boilers being maintained between limits of 13.0% and 14.5%. The following figures show the boiler room results for the month of December, 1919:

Load on boilers in per cent of rating .....	91.0%
Gross boiler plus economizer efficiency .....	84.5%
Gross boiler efficiency .....	80.0%
Amount of steam used for atomizing oil .....	1.0%
Net boiler efficiency .....	79.0%

These percentages do not take into consideration the additional amount of steam used

for atomizing the oil with hand firing, but refer to excess air only. When the boilers were fired by hand the atomizing steam was supplied through a line on which there is no flow meter and consequently accu-



Exterior view of power plant showing tapered construction of reinforced concrete stack, 220 feet high.



This cooling pond measures 150 by 400 ft. and is one of the largest in the country. Each condenser in the plant has its own motor-driven centrifugal circulating water pump for supplying the cooling water from the pond.

\*See "Economy of Certain Arizona Steam-Electric Power Plants Using Oil Fuel," by C. R. Weymouth, presented before the American Society of Mechanical Engineers at Detroit meeting on June 16, 1919. Also "A Record in Fuel Oil Economy in Arizona Plants," by C. R. Weymouth, Journal of Electricity for August 1, 1919.

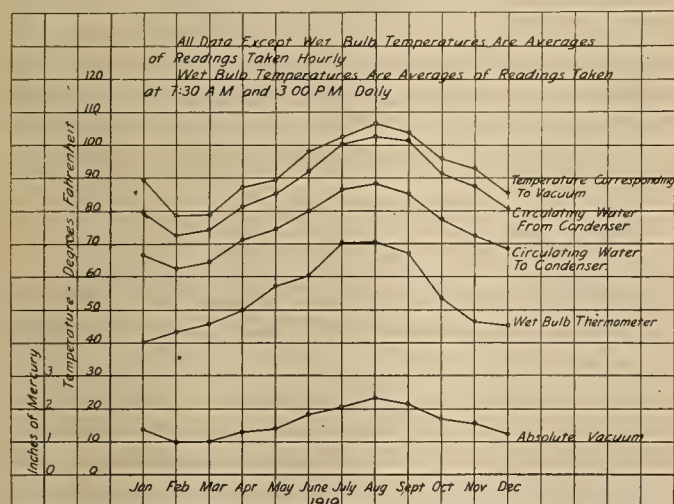


rate data on this item is not available. It has been the writer's experience that with hand firing the atomizing steam will vary from 2.0% to 4.0% of the steam generated, depending on the skill and experience of the operator. Observations on the boilers at this plant would indicate a steam consumption of at least 2.0% for atomizing, which is a loss of 1.0% over the amount shown for automatic control.

With regard to the efficiency of the automatic control of the firing of the boilers as compared with hand firing, it has been found that the boiler room efficiency is 4% to 5% higher when the regulators are in operation than when firing and damper setting are done by hand. The comparison has been made at times when the regulators were taken out of service for inspection and general overhauling, and the firing and regulating of dampers done entirely by hand.

### Operation of Automatic Regulators

The automatic regulators do not relieve the fireman of all responsibility in connection with the firing, however, for it is necessary to watch the burners carefully to see that they are working properly. It occasionally happens that a burner becomes choked or partially so with carbon, which reduces



In the summer the circulating water for the condensers gets very warm, and the vacuum is influenced by a scale forming in the condenser tubes. Much lower economies prevail during the period of these extreme temperatures.

the size of the flame. This results in a considerable amount of excess air in this particular boiler and unless the burner is changed, may result in a serious loss in efficiency. The fireman must be trained, furthermore, to understand the value of the gas analysis in its relation to efficient operation. This is necessary because it is essential for him to make adjustments on the main damper regulator to compensate for changes in draft conditions due to atmospheric changes. Thus for instance, if the dampers are set during the day to give proper combustion and at night the air cools down considerably, the stack draft increases and more air will be drawn into the boilers than is necessary. When the fireman finds that this condition exists, by turning a hand wheel and tightening a spring on the damper regulator the dampers are set for the new draft conditions and automatically take care of changes in load as before. It has been found in this plant that this adjustment

for changes in draft due to atmospheric changes is a very important part of maintaining high economies.

### Maintaining Economy

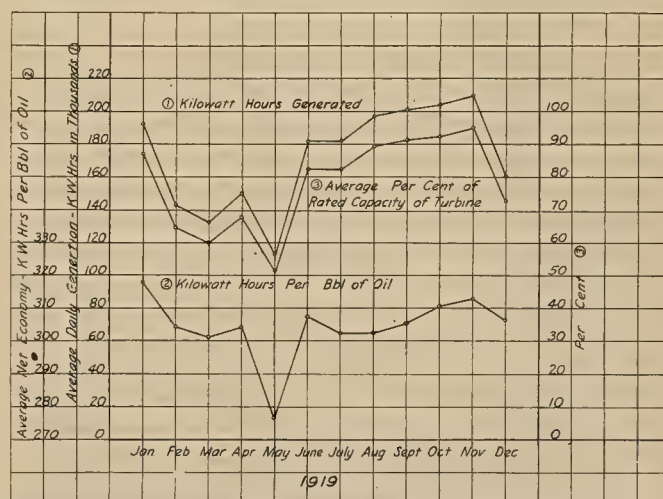
In order to obtain a maximum of effort on the part of the operating force, in maintaining the proper economies, the economy is worked out for each watch and posted daily. The rivalry thus promoted has aided materially in maintaining good operating results in the plant. The results thus posted every day are:

Kilowatt-hours generated.  
Barrels of fuel oil used.  
Pounds of water evaporated.  
Kilowatt-hours per bbl. of oil.  
Pounds of water per pound of oil.

The equipment used to obtain this and other data is as follows:

For accurately measuring the fuel oil two carefully calibrated tanks are used, it being possible to obtain the oil consumption within less than one-half of one per cent.

A Cochrane V notch meter in the feed water heater and a Venturi meter on the feed water line to the boilers give the amount of water evaporated.



Load efficiency curve. All efficiencies shown or given in terms of kw-hr. per barrel of oil are net, all power used in the plant being deducted from the total generation before figuring the efficiency

A General Electric steam flow meter gives the amount of steam used for atomizing the fuel oil.

The boilers are provided with draft gauges, superheated steam thermometers, flue gas thermometers and Uehling CO<sub>2</sub> recorders. Thermometers are also provided on the economizers for gases entering and leaving, and water entering and leaving.

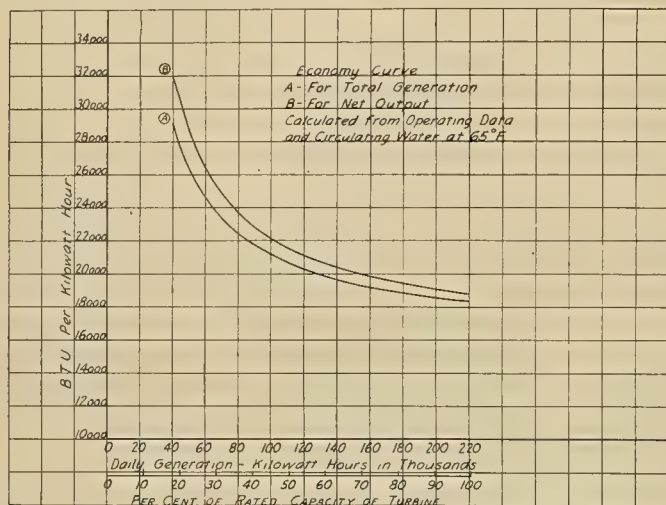
Readings are taken hourly and logged, of all of these instruments, and thus it is an easy matter to locate any losses of efficiency which may occur.

As the town of Ajo is situated in the desert, extreme temperatures prevail in the summer months and consequently much lower economies are obtained during this period. The circulating water for the condensers gets very warm, this resulting in a material loss in vacuum. The vacuum is also influenced by scale forming in the condenser tubes, but this loss can be easily remedied by cleaning the tubes out with a proper cleaner. To determine when it is



necessary to remove the scale, tests are run, from which a heat balance for the condenser can be worked out. From this heat balance the heat transfer through the tubes can be determined and when this figure falls below a certain point the tubes are cleaned.

In spite of the very low vacuum during the summer months, fairly good efficiencies can be obtained, as shown by the load-efficiency curve. During February, March and April the load was very low, which accounts for the low efficiencies obtained, when the



Economy curve showing the relation between the load and B.t.u. supplied per kw-hr. during the year 1919.

vacuum was relatively high. During the first twelve days of May the turbine was run with practically no load except the plant auxiliaries, but the plant was in readiness to pick up at any time the full load. This accounts for the low efficiency shown for this month, the average for the last nineteen days being 303 kw-hr. per bbl. In June the load was increased practically to normal conditions, and these conditions held until in December the load was again reduced with a corresponding drop in efficiency. All efficiencies shown or given in terms of kw-hr. per barrel of oil are net, all power used in the plant being deducted from the total generation before figuring the efficiency.

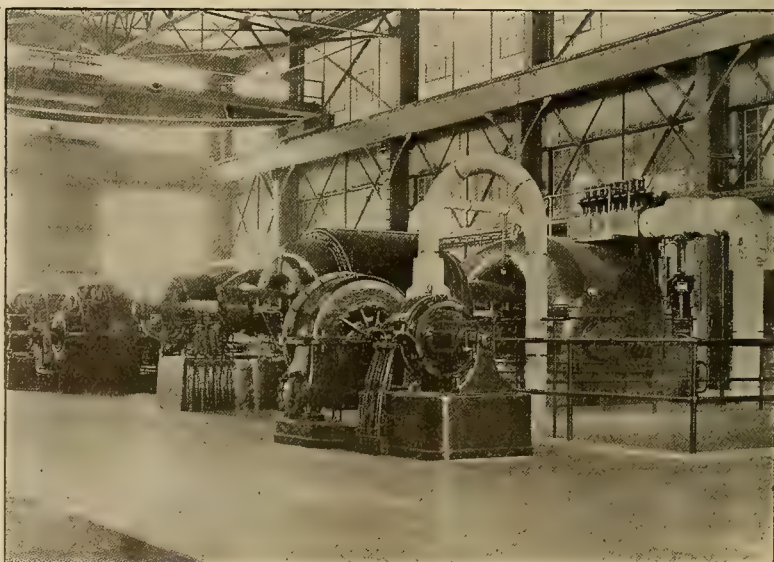
The best economy obtained by the plant during 1919 was for the last eleven days of January. During this period the load averaged 8085 kw. The temperature of the circulating water was 68.8 degrees, and the vacuum 1.28 inches absolute. The average net economy was 323.1 kw-hr. per bbl. Individual days showed as high as 327 kw-hr. per bbl., and individual shifts better than 330 kw-hr. per bbl., but these results are not as accurate as those taken over a longer period. The economy curve showing the relation between the load and B.t.u. supplied per kw-hr. generated is calculated from the results actually obtained in the plant during the year 1919. In some cases on the low loads correction was made for circulating water temperature, as the loads occurred when the water was about 75°. At the higher ratings, however, the curve corresponds to the actual existing temperatures and conditions.

Notwithstanding the fact that with a cooling pond and spray nozzles it is necessary to pump the circulating water against a considerably greater head than should ordinarily be necessary in a sea-water plant, the power used by the auxiliaries compares quite favorably with plants of the latter type. The average amount of power used by the auxiliaries during 1919 was 3.2% of the total generation and under normal full load this figure is 2.75%. The auxiliaries include the circulating water and hot-well pumps, air washers for generators, economizer scrapers, motor-generator for switch control power, and station lights.

#### Motor-Generator Sets

In addition to the generating equipment the plant contains the motor-generator sets which furnish the direct current for the electrolytic deposition of copper. There are four of these sets, three being in continuous operation and the fourth a spare. Each set consists of a 2400-hp. synchronous motor direct-connected to an 850-kw. direct current generator on each end of the shaft. These generators are rated at 5000 amperes at 170 volts, and as normally operated carry the full load current at 160 to 170 volts. Thus with three units in service there is a total load of 30,000 amperes at 160 to 170 volts on the d.c.

Turbine room of the New Cornelia Copper Company plant at Ajo, Arizona. An auxiliary exciter unit made by the Allis-Chalmers Company is shown in the foreground. Behind this is one of the turbo-generators and in the background can be seen the four Westinghouse motor-generator sets. Three of these sets are in continuous operation, and carry a total load of 33,000 amperes at 160 to 170 volts on the d.c. side for twenty-four hours a day.





side. As this load is continuous for 24 hours a day it gives the plant a very high load factor, at times 94% and averaging about 90%. This aids materially in maintaining high economies. The motors being synchronous make it possible to keep the power factor at 98 to 99%, which has made it possible to carry peak loads of 10,000 kw. on one of the main generators.

Accompanying illustrations show the power plant, cooling pond and interior of the plant. The cooling pond is one of the largest in the country, being 150 feet wide by 400 feet long. The turbine room is shown, an auxiliary exciter unit made by the Allis-Chalmers Company appearing in the foreground, then one of the turbo-generators, and in the background the four Westinghouse motor-generator

sets. The design and installation of the plant were made by Chas. C. Moore and Company, Engineers, with the approval of A. G. McGregor, consulting engineer for the New Cornelia Copper Company.

Although the production of copper by the New Cornelia Copper Company did not begin until early in 1917, it was quickly developed into one of Arizona's big producers and today stands among the foremost in the country. As most of the copper produced is deposited electrolytically from the acid which leaches it from the ore, and as most of the process from the firing of the blasts to the loading of the copper on the cars is dependent on electricity, the New Cornelia Copper Company can be classed with the big industries of the West which "Do It Electrically."

## Electrical Service in the Northwest

BY GEO. L. MYERS

(In any survey of electrical resources and development, statistics from a single company are significant of the growth of the district served by that company. The following interesting summary of the activities of one northwestern utility is by the assistant to the president of the Pacific Power & Light Company.—The Editor.)

Pacific Power & Light Company operates electric, gas, water and electric railway properties in the states of Idaho, Oregon and Washington. The value of its properties is about \$19,000,000, and it had a gross revenue in 1919 of \$2,175,922. Of this gross the relative amount in percentage for each class of service was electricity 72%, gas 13.5%, railway 9%, and water 5.5%. Therefore, slightly less than three-quarters of its gross revenue is from electric service. There has been added to plant account since its organization in July, 1910, for property acquired, improvements and additions, almost \$7,000,000, or 57%.

The company serves 65 communities, 61 with electricity, seven with gas, four with water, and two with electric railways, exclusive of interurban. At commencement of operation it served 15 communities, 13 with electricity, five with gas, three with water and two with electric railways. The population served in 1910 was approximately 75,000. As of December 31, 1919, it was estimated to be in excess of 157,000, or an increase of 109%. Electric, gas and water customers increased from 15,858 in 1910 to 42,203 in 1919, or 166%.

### Power Resources and Load

In 1910 there was a hydroelectric generating capacity of 6600 kw., and a steam capacity of 4850 kw., or a total of 11,450 kw. The present capacity in hydro-electric is 15,775 kw. and in steam 6240 kw., or a total of 22,015 kw., an increase in total capacity of 92%. The company since 1910 has made physical connection with the Washington Water Power Company of Spokane, Washington, at Lind, Washington, and Northwestern Electric Company of Portland, at White Salmon, Washington, from which to draw for additional power or sell its own surplus. The kilowatt-hour output, generated and purchased, for the eight-year period, 1912-1919, increased from 36,348,770 to 71,952,068, or 97%. The connected

load for the 1912-1919 period increased from 18,966 to 48,144 kilowatts, or 154%.

The mileage in high voltage transmission lines in 1910 was 181, and in 1919 it was 515, or an increase of 184%. Of the total of 515 miles 14.5 are 11,000 volts, 87.5 miles 25,000 volts, and 413 miles 66,000 volts. The mileage in distribution lines increased from 215 in 1910 to 790 in 1919, or 267%.

The electric railway service is an urban and interurban system at Walla Walla, Washington, of approximately 28 miles, operated by Walla Walla Valley Railway Company, a subsidiary of the Pacific Company; and an urban system at Astoria, Oregon, of 5.5 miles, operated by the Pacific Company.

The foregoing facts are significant of the comparative growth and development of the company in value, gross revenue, service and property. Since the acquisition of its various properties, practically all of its electric properties have been welded together and the electric properties in eastern Washington, constituting the Yakima-Walla Walla system, inclusive of the Pendleton, Oregon, district, form a complete unit of continuous high voltage transmission lines. Those electric properties that have not been interconnected are in The Dalles-Hood river and Astoria-Seaside districts in Oregon, and Goldendale district in Washington. The electric property at White Salmon, Washington, has physical connection with The Dalles-Hood river district. This has been conducive to increased operating efficiency and economy and a greater assurance of continuity of service than was possible when the properties were operated separately and as isolated units.

### Territory Served

The company operates in a territory principally agricultural and horticultural. There is a constantly growing demand for power. The gradual development of the agricultural and horticultural resources has brought about an increasing population with a



greater need and larger use of electric service for ordinary domestic conveniences and necessities. This has resulted in the development of industries allied with the products of agriculture and horticulture, such as beet sugar factories, canneries, dehydration plants, refrigeration plants, flour mills, feed mills, packing plants, creameries, condensaries, etc., which have necessarily increased the demands for electric power. The centers of greatest industrial activity are at Vancouver, Washington, and Astoria, Oregon, occupied in shipbuilding, lumbering, fisheries, dairying, milling and miscellaneous manufactures. The company has been meeting the increased demands for power as they arose, even though financial conditions have made it difficult to do so. Of the company's gross revenue 9% is from irrigation motors, amounting to 5778 horsepower, or 10.2% of the connected load. There are extensive areas susceptible of development through irrigation by pumping and the use of these unproductive areas in the development of communities of which they are a part is dependent upon the increased use of electric power.

#### Future Development

The company's plans for the future in respect to major developments have not taken definite form, awaiting the proper readjustment of economic life and public opinion to a somewhat normal and conservative state. The only electrical development of magnitude now being made by the company is at Astoria, Oregon. To provide additional power capacity a steam plant is being built, the first installation of which consists of a 3000-kw. turbo generator, at a cost of \$700,000, and an additional investment of \$30,000 is being made in distribution lines to connect

the new steam plant with the distribution system. The present power capacity at Astoria and Seaside is 2490 kw., and the capacity of the electric steam plant of the Hammond Lumber Company, from which this company purchases power, is 4100 kw., or a total present steam power capacity of 6590 kw. The present power capacity, together with the capacity of the new electric steam plant, will make an available total power capacity of 10,340 kw. at Astoria.

The company's territory within its field of operations has excellent possibilities of industrial development. There are varied resources in raw materials and large possibilities of industrial development allied with the intense growth of agriculture, horticulture and stock raising, which is becoming more diversified. Additional future uses for electric power are in manufactures of the products of timber and wool, chemicals and fertilizers, and it will only be a question of time when the steam railroads will be electrified, all of which will make large demands for the use of undeveloped water power. There are adequate undeveloped resources in water power within the company's territory to take care of future demands. These resources will be developed as rapidly as economic justification and financial conditions permit. Some potential industries will be largely dependent upon economical power. Most of them, as is generally the case, will not be, as their location will be dependent upon resources and facilities that are interdependent in determining location, such as source and extent of raw materials, labor supply, transportation facilities, and proximity to markets, not the least of which is a constructive public opinion that will encourage the investment of capital.

## Cumulative Cooperation

BY S. M. KENNEDY

(The complexity of modern civilization has created a state of affairs in which no individual can claim genuine isolation. What one man does reacts upon the community, and conversely, the good of the whole is in the last analysis the good of the individual. This involuntary responsibility necessitates the most comprehensive kind of cooperation, as discussed here by the vice-president and general agent of the Southern California Edison Company in the concluding article of his series.—The Editor.)

There are some words in the English language whose original meanings have changed somewhat in the course of time, and it would seem as if the word "cooperation" were one of this class. The modern definition of cooperation is "the act of laboring together with others for a common end."

#### The Cooperative Society

The pioneer of cooperation in Great Britain and America was a man named Robert Owen, and his type of cooperation bordered on communism. Cooperation has always consisted of two kinds—simple cooperation, when individuals strive to help each other in the same employment, and complex cooperation, when they attempt to do so in different employments. In Robert Owen's time, about one hundred years ago, there were great philanthropic ideas advanced along the lines of community cooperation, many of them meeting with failure, and the best meeting with only a limited success. During the nineteenth century the cooperative society spread to

France, Germany and America, but did not take hold in the same manner it did in Britain. In the latter country the most notable and perhaps the most successful experiment was in Rochdale, which has been called "the Mecca of cooperation." There they developed what is termed "cooperation in production and cooperation in distribution," the latter being designed to save profits by cutting out the middle man. In the United States, cooperation of the community type like Rochdale has made little progress. There has been a great development of mutual insurance and building and loan societies, which are examples of cooperative action. Cooperative distribution has attained no marked success, and cooperative production still less. Profit sharing is the nearest approach to this principle in manufacturing concerns. Cooperation in the last century had more or less of a concrete form, but today in the public utility business it is dealt with more in the abstract and might best be termed "The Cooperative Spirit." The co-



operative spirit today does not aim at cutting out any wing of an industry, the middle man or any other man, but rather aims at helping each wing properly to fulfill its particular function.

### The Cooperative Spirit

It was Elbert Hubbard who said, "The valuable man in any business, is the man who can and will cooperate with other men. Men succeed only as they utilize the services and ideas of other men." The spirit of cooperation is a vital element in every successful business; it tends to the fullest development of the individual and necessarily of the business as a whole, and fosters a feeling that gives a man a joy in his work. The spirit of cooperation means not only acting or laboring together to a common end, which may be more or less mechanical, but it means putting the soul into the work; all having at heart the one purpose, thinking, planning and dreaming it, as well as working for it, cheerfully and enthusiastically. That is cooperation in its highest form, and there are few businesses and fewer industries that have yet developed the cooperative spirit to such a degree. Yet it is entirely possible to instill this vital force into an organization and to foster and maintain it. It may be termed an intangible force, like personality, on which it depends to a considerable extent. In many organizations in the public utility business, little or no attention has been paid to the development of the spirit of cooperation in the past, and such organizations have suffered in consequence. It is fast becoming a recognized factor in economy—confidence and strength from the standpoint of the progressive management, and of development, opportunity and advancement from that of the thinking employee. In a large organization the spirit of cooperation means team work and something more. It is intangible and yet a real force, as is the college spirit to a university, esprit de corps to a regiment, civic pride to a municipality, and patriotism to a nation.

In applying the term "cumulative cooperation" to the central station industry, the idea is to show the advantages to be derived from "heaping together" the results to be obtained from developing the spirit of cooperation in the various branches, so that the industry as a whole may feel its beneficial effects. It seems advisable to start with the individual employee and first discuss the subject of

### Cooperation with One's Self

On the face of it, self cooperation may sound paradoxical. It takes two to make a quarrel, and some may think it takes at least two to practice cooperation. On the other hand, there is a verse in the Bible which reads, "But when thou doest alms, let not thy right hand know what thy left hand doeth." It may be granted that this is metaphorical, but if it is not possible to segregate part of one's self for one purpose, it is surely possible to cooperate with all parts of one's makeup for another purpose. An employee of a utility company may have decided talents along certain lines. He may have the very qualities which are needed for important positions ahead—but he may be handicapped by himself. If he is careless about his personal appearance, if his

clothes are untidy, his shoes down at the heel, his collar soiled or his hat dirty, then he is condemning himself in the eyes of others who are observing him. Such indifference is not self cooperation. Again, in the daily round of his work, is he prompt, or is he tardy? Is he at his desk at the appointed hour in the morning, and after lunch is he back at the hour expected? Does he waste the company's time? Does he keep other employees awaiting his appearance in order to transact the company's business? If he does, then he is doing the reverse of cooperating with himself. Others are noting his movements and they won't forget when promotions are under consideration. His company has framed certain rules and regulations for its employees to go by. Does he go by them, or "go-by" them? If the rules are disregarded, then he is not cooperating with himself. Further, in transacting business with the company's patrons, does the employee always treat these patrons with proper consideration? Is his voice gentle, attitude conciliating and his words courteous? If not, then there is a distinct absence of self cooperation. Is he doing his best at all times and under all circumstances, in his business and in his home, during his work and at his play? Does he hold that inward desire to do what is right and appear to the greatest advantage? Then, if he does, he has acquired the spirit of self cooperation, a valuable asset on which he will some day realize substantial dividends.

### Cooperation Among Employees

To accomplish the greatest possible results, employees as individuals must cooperate with each other. Business without cooperation is like sound without



Good feeling and the spirit of cooperation among employees is not a mere adjunct to business; it is an essential factor, and should be cultivated in every possible way.

harmony,—it stunts individual character, strangles ability and exaggerates difficulties. It is a tremendous handicap for men to work under such conditions. Take the volume of business being handled by a force in which lack of harmony is conspicuous—put it in the hands of an organization that is working in the right spirit and all the leaks and waste that accompany discord will at once be converted into savings of time and money. The spirit of co-

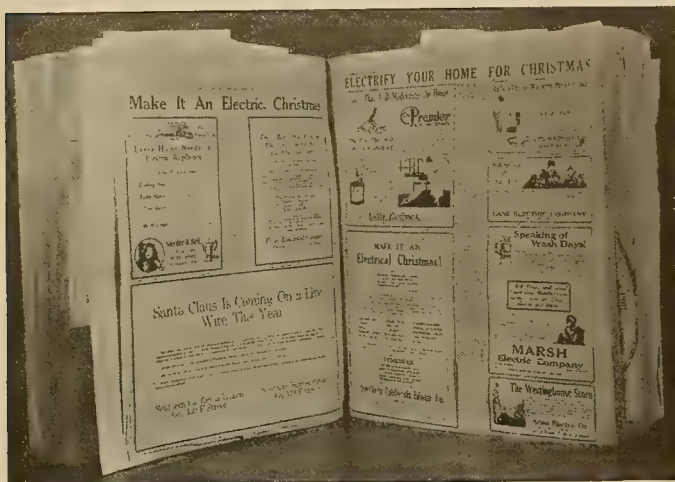


operation is just as important between the different departments of an organization as it is between the different workers in each department. Each individual and each department has its functions. The manner of doing the work finally means a success or failure of the whole concern. Of what ultimate good to himself or to the organization is a well balanced man in a well run department, if the other members and departments making up the organization cannot or will not cooperate with each other and for the benefit of all? In the long run, a man is going to get just about what he is entitled to—that is, what he earns. If he works selfishly, which is short-sight-

away their largest asset by failing to create and develop that spirit of cooperation, that friendly relationship with subordinates, which makes for the highest success. Organizations and business enterprises seem to grow bigger as the years go by, but personality is also increasing in value. The executive or manager of today, to be successful, must through his personality create a spirit of cooperation and loyalty—not to himself alone, but to the great organization of which he for the time being is the head, and of which his lieutenants are important parts. Such an organization can accomplish anything in reason. A great ironmaster once said, "Take away all our factories and trade, our avenues of transportation, our money, but leave me an organization, and in four years I shall have re-established myself." No man could talk with such assurance if the true spirit of cooperation did not permeate his organization from top to bottom.

### Cooperation with the Industry

In what is termed the electrical industry, there are numerous branches each presumably fulfilling its own particular function. This condition does not prevail with other utilities such as water, gas and telephone companies, except to a limited extent. The principal segregations in the electrical industry are, the central station, the manufacturer, the jobber, the dealer and the contractor—each branch has a mission of its own, but all are tied in together—distinct as the billows, yet one as the sea. However, if one branch of the industry does not properly fulfill its function then the work must be done by one or more of the other branches. When the business of distributing electrical energy first started, it was all in the hands of the central station, which was then distributor, manufacturer, contractor, dealer and everything else. As the business developed, the other branches sprang into existence and the central station operators were glad to concentrate on the production and distribution of electrical energy. But where and when the other branches did not keep pace with their growing responsibilities, then the central station had still to perform the functions of the weaker or lagging branches. In some parts of the country there were, and there are today, many dissensions among the various branches of the industry. One branch will claim the other is eating into its business and another branch will claim that its neighbor is not doing its duty. In some localities conditions were strained to a point of open war. It has been said that before cooperation comes in any line there is always competition pushed to a point that threatens destruction and promises chaos; then to avert ruin, men look for a better way, a plan that conserves and economizes, and this better way is found in cooperation. Some attempts have been made at so-called cooperation, when the plans really spelled coercion. Men were threatened instead of persuaded, and as a natural sequence, such combinations were short-lived and the last state was worse than the first. There is no industry in which cooperation can be made so effectual as in the electrical, but the union must have the real spirit and not the



Cooperative advertising has been a marked feature of recent electrical activities, and is proving of immense value both to individual firms and to the industry as a whole in propagating the electrical idea.

edly, and cannot cooperate with his fellow employees, and does not consider the interests of the organization as a whole, he will not go very far. On the other hand, the man who earnestly cooperates with his fellows, works loyally for the good of his company, which is his good also, will find before long that the net results of his work will show for themselves. Such a man is a credit and a profit to an organization—and his future is assured. There never was a time in the history of this country when there was so much industrial unrest and so much vague dissatisfaction among workers. There seems to be a recklessness among wage earners that has no parallel. They need guidance and leadership of the right character more than anything else. One of the chief duties of an executive is to do everything that will help to develop this spirit of loyal, hearty, enthusiastic cooperation, from the heads of departments down to the newest employe, filling the smallest position. It can be done by taking a live personal interest in their welfare, and encouraging them to improve their present conditions and future prospects by cultivating the spirit of cooperation, and getting out of it the inherent benefits which accrue to those who believe in it. Managers of today and some of the future must have the faculty to manage men—which is a more difficult problem than operating a motor or running a generator. The human element in industry is still larger than the mechanical element, and managers, superintendents, and foremen often lose, or maybe deliberately throw



imitation. There is a positive cooperation and a negative cooperation. A farmer was one day driving a team of horses attached to a cultivator, and a stranger stopped to look on. "Your horses work well together," said the stranger. "Yes," replied the farmer, "one is willing to do all the work, and the other is willing to let him." This is a sample of negative cooperation which is not infrequently seen where others are struggling to make the positive or real cooperation a success. Cooperation in the electrical industry should be definite and simple; simple, because it should not involve methods that may be termed experimental, freaky or untried, and definite, because the end to be looked for is a better understanding, through consistent and persistent educational endeavors, between the different branches of the industry, and between the individuals who make up the different branches. No attempts should be made to dictate to any individual or branch of the business what must be done. No one part of the industry should say to one neighbor, "Thou shalt not!" or to another, "You must not!" and no one should be threatened, intimidated or cajoled. On the other hand, every reasonable effort should be made to educate and inform each branch of the industry as to how its own particular business may be more efficiently handled, and a constant effort made to assist each branch more intelligently to understand some of the problems and perplexities of the other branches. Real cooperation is an appeal to the intelligence of the individual rather than an appeal to the old-time prejudices of any group. It should be the crystallization of a desire to have each branch of the business recognize the responsibilities it owes to the other branches of the industry, and to teach the individual that, after all, he may to some extent be his brother's keeper. Discord in the electrical industry stunts development, for there cannot be a canker in one branch without affecting the whole. On the other hand, true cooperation benefits all. The contractor gets more orders on a profitable basis and is able to accumulate capital and extend his business. The work of the contractor means that the dealer sells more supplies and appliances. The dealer looks to the jobber to meet his increased demands. The jobber sends larger requisitions on the manufacturer, and with it all, the central station adds more consumers and sells more electric energy. Such cooperation means harmony and advancement. It brings about cooperative methods for displaying and merchandising, cooperative advertising, and cooperative distribution of educational literature and electrical knowledge. But with it all, there should be modesty and appreciation. In the past the thing that has usually made cooperation successful has been a moderate amount of adversity. Too great prosperity has wrecked many well intentioned cooperative schemes. Prosperity is apt to make men reckless and forgetful of their obligations to others, but in the electrical industry, cooperation, if properly guided, should only be strengthened and cemented by the prosperity of the individuals who are its beneficiaries.

### Cooperation with the Community

A man's value to the community in which he lives lies in his ability to think individually and act collectively. A man connected with a public utility cannot be of proper value to himself and cannot properly advance the interests of the organization with which he is connected unless he cooperates with the community wherein he dwells and has his business connections. In all civic organizations, such as boards of trade, chambers of commerce, merchants' associations and business men's clubs, the live public utility man should be a conspicuous figure. In the construction of the modern automobile, there is the engine, the running gear, and the tonneau. In all civic organizations like those referred to, there are the parts to correspond with the automobile. First, the executive, which represents the motive power and resembles the engine; second, the men who do the work and carry the load, which corresponds with the running gear of the auto; third, the men who are carried along, but who do nothing but look pleasant. These correspond to the tonneau of the car. Now the public utility man should be a hustler and faithfully represent the progressive character of his business. His standing in the community will usually reflect the standing of his company. In his connection with civic bodies, he should not be one of those who always ride in the tonneau and do nothing. He should be alive and aggressive, and he will learn that both himself and his company will be the gainers by his brushing up against and cooperating with the other men. In local politics, however, the public utility man should not be aggressive, otherwise he may injure his value to his company and maybe impair its standing. The utility man should in all political affairs take no public stand unless in a crisis. Political parties come and go, but the central station business goes on continually. He should hold his own views as a private citizen and vote and act accordingly. Communities need the true spirit of cooperation among their citizens for protection and advancement. Men cannot work together, save for the common good, and active cooperation in local affairs will benefit the individuals and the business interests of those locally established.

### Courting Success

The greatest game in the world is success and every man is playing his cards to win. Success is made up of many attributes and no one element in itself can assure it. The annals of successful men clearly demonstrate that all such men knew the value of cooperation—could cooperate themselves and always picked assistants who understood the meaning of the word. The young man who will commence by cooperating with himself and carry the spirit of cooperation in all his contacts with his fellows, will gradually bind success unto himself "with hoops of steel," and will eventually reap the desired fruits of cumulative cooperation.

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### NOTE

The articles comprising the series by Mr. Kennedy will shortly appear in book form.



# A New Equation for Gravitational Force

BY DR. A. C. CREHORE

(Modifications in the current form of electromagnetic equations point to the necessity of a revision of the well-known equation of Newton, which expresses gravitational force between bodies in space. The author, one of our best known physicists, herein discusses some of the defects in the present equation and the modification of the well-known Lorentz equation, in which he answers some very pertinent objections made by Schott, a contemporary physicist, who has urged other modifications in theory. This paper constitutes the eleventh by this author appearing serially in the Journal of Electricity under the title "The New Physics."—The Editor.)

In this section we shall consider more in detail the source from which this gravitational equation was derived. It has not been derived directly from the current form of electromagnetic equations, but these have required some modification. The surprising thing is that the modification required is so little. It may be said that the above equation would never have been obtained without the use of the present form of the electromagnetic equations. This equation was obtained by taking the time average of a much longer equation, that which represents the instantaneous force between the two electrons when they are in certain positions in their orbits. Each averaging process simplifies the equation. For example, there are no terms in the above equation that refer to time. The time disappeared in taking the time average, and contributed only to the numerical coefficient. So, again, in the space average later, the terms containing  $X$ ,  $Z$  and  $\alpha$  disappeared and entered into the numerical coefficient, giving a very simple final result.

## Defective Equations

In the original equation for the instantaneous force there appears in the coefficient multiplier of the equation the so-called Doppler factor,

$$A = \frac{\delta t}{\delta \tau} = 1 - \frac{Q \cdot R}{CR}$$

This appears as  $1/A^3$  in the coefficient of the equation. Now, when the speed is very small as compared with the velocity of light, the second term of  $A$  becomes very small, and the value of  $A$  approaches unity when the speed approaches zero. In deriving the time average of the instantaneous force, the author assumed that this factor was sensibly equal to unity. With this assumption the equation obtained is not exactly the same as that given above, but is exactly the same, if we omit the factors  $m_0 \beta_1^2$ . To omit these quantities means that the magnitude of the force is very different, since  $m_0$  is equal to  $.898 \times 10^{-27}$ , and  $\beta_1^2$  of the order of  $10^{-4}$ . Without these factors the derived force was, therefore, this great number of times larger than the gravitational force. This result is not only absurd, but it is fatal to the present form of the electromagnetic equations, for we are absolutely certain that no such great force exists at these large distances. If the theory predicts them, the theory is erroneous.

Moreover, the omission of the  $\beta_1^2$  is just as bad as the omission of the  $m_0$ , although it does not affect the magnitude so much, because its omission means that one body must attract the other with a different force from that exerted by the other body on the one. This is contrary to one of the best established

laws we possess, due to Newton, that of equal action and reaction.

There is justification for the inclusion of both of these factors, and the fact that we obtain an equation that represents the gravitational laws faithfully in all respects when we do include them is additional justification. The justification for including the  $\beta_1^2$  is that it makes the force conform to the established law of equal action and reaction. The justification for including  $m_0$  is that without it the dimensions of the equation are not correct, and the quantities on the right of the equation do not represent a force. The dimensions of force are

$$F = L M T^{-2},$$

and the dimensions of the right member without the  $m_0$  are on the electrostatic system of units,

$$L M T^{-2} k,$$

which cannot be the same as force. On the space-time system, putting  $k = L^{-1} T$  and  $M = L T^{-1}$ , these become respectively

$$F = L^2 T^{-3}$$

and

$$L T^{-2}$$

These last dimensions require to be multiplied by a velocity in order to make them equivalent to a force. That is to say, they must be multiplied by a mass. Since  $m_0$  is a mass, and since its numerical value when coupled with the  $\beta_1^2$  brings the magnitude of the force into agreement with the gravitational force, we are justified in believing that the original equations were defective in not including such a quantity. It is most significant, too, that the numerical value of the mass required to make this correction should have a value equal to the mass of the electron itself. It ought to be directly related to the electron if we are on the right track in getting at the origin of the gravitational force.

## Modification of the Lorentz Equation

It must be stated here that the author has been taken to task in a long article by G. A. Schott for making what he considers an error in the derivation of the average force from the original electromagnetic equations of Lorentz. The error consists in assuming, as was done, that the Doppler factor above referred to is sensibly equal to unity. Fortunately Schott has checked the original equation for the instantaneous force with which we now begin, and finds the same result. And again, he has checked the equation that the author obtains as the time average of the force on the assumption that this Doppler factor is equal to unity, namely, the equation given above omitting the  $m_0$  and the  $\beta_1^2$ . He has



gone further and has obtained a time average assuming that this Doppler factor is variable with time. The result that he thus obtains does not resemble the gravitational law in any other respect than one. This is that the force is inversely as the square of the distance. The fact that we obtain an equation that represents gravitation so exactly in the manner that has been described above is of considerable interest in itself, especially in view of the fact that it is known that the present form of the Lorentz equations is deficient in certain cases. It is our diagnosis that this is one of the cases where it requires modification, and we are particularly fortunate to have been led so near to a result which expresses the facts by sticking to the equations as far as we have without the necessity of modifying them.

A New Form of Electromagnetic Equations

Since this work was published Mega Nad Saha has derived a new form of electromagnetic equations based upon considerations of the general Minkowski space, and in accordance with the theory of rela-

tivity. His results show that the  $\delta r$ , which appears above in the expression for the Doppler factor, should be regarded as the differential of a generalized Minkowski space coordinate. This involves  $x, y, z$  and  $t$ , and does not depend upon time alone. In other words, reasons have already appeared from a quite independent source why there must be some modification in the Lorentz form of electromagnetic equations. It seems necessary to the author that these changes will eventually show that some such factor as  $m_0$  will have to be introduced into the original equations. Also that a similar factor will appear in the so-called Doppler factor, the second term of it, which will result in its having a value that approximates unity very closely indeed.

The result of Schott, taking this factor as given above, will therefore prove to be of little value. It gives no useful result as it stands.

The above explanation has been offered for the reason that among physicists this criticism of Schott has been widely circulated. It is believed that it is fully met.

Office Records—Their Filing and Indexing

BY IRENE WARREN

(Facility of reference, and general convenience in handling filed material may be greatly increased by transferring data from letters to cards where possible. The following article, the ninth of the series by the Director of the Chicago School of Filing and Indexing, describes some of the methods of handling card record systems in various types of business.—The Editor.)

CARD RECORDS

Every effort is made so to arrange the files of correspondence, orders, bills, and data of various sorts that they will index themselves. Card indexes are made only when cross references are needed, except in the case of the numeric system which always demands an alphabetic card index.

But a vast amount of information in business houses today is kept on cards, and some of these card forms are so universally used that they have become standardized and are for sale by firms selling filing equipment. Among these are cards for keeping perpetual stock records, for indexing trade catalogs, for recording information for dentists, insurance agents, banks, and other specialized lines.

Many times the information contained in letters can be made more readily available if transferred to cards. A purchase department will find it much more convenient to transfer to cards information as it is received regarding prices of items, than it will be to consult the various original letters when they wish to place an order. The file clerk should be familiar with the card forms on the market so that if one exists that will fit the company's needs for any new record desired, it may be purchased promptly and save the time and expense of printing a new form. If a new card must be planned, then attention should be given to its every detail. Many card records fail to meet the demands made on them because they have not been carefully enough thought out.

Arranging Information

First, the information to be placed on the card should be carefully assembled and arranged so that

the word under which the card is to be filed stands first; like information should be grouped together; and some definite sequence of subject matter followed. It is difficult to choose a terminology as brief

The image displays a variety of standardized card forms used in business filing systems. At the top, there's a form labeled 'ARTICLE' with columns for 'Date', 'Page', 'Delivered', 'No.', 'on Hand', 'Date', 'Rec'd', 'Delivered', 'No.', 'on Hand', 'Date', 'Received', 'Delivered', 'No.', 'on Hand'. Below this is a 'BILL' form with fields for 'NAME', 'ADDRESS', 'DATE', 'ITEM', 'FAM', 'DEBIT', 'CREDIT', 'BALANCE', 'DATE', 'ITEM', 'FAM', 'DEBIT', 'CREDIT', 'BALANCE'. There's also a 'STOCK' form with a grid for months from JAN to DEC and a 'GENERAL' form with fields for 'NAME', 'ADDRESS', 'DATE', 'ITEM', 'FAM', 'DEBIT', 'CREDIT', 'BALANCE'. Other forms include one for 'INTERESTED IN' with a grid for months, and several forms for 'NAME', 'ADDRESS', 'DATE', 'ITEM', 'FAM', 'DEBIT', 'CREDIT', 'BALANCE' with different layouts. The forms are shown overlapping to illustrate their variety.

Large numbers of cards are already manufactured which provide for numerous and diverse types of data. If a new form must be planned to meet a special need, the greatest care should be used in its preparation in order that it may meet all demands and really add to the efficiency of the filing system.



as that which is printed on the cards must be, and especially so if the cards are to be filled in by more than one person.

The type should be clear and small. Sometimes it is a good plan to use several different styles or sizes of type, or different colors to make the information stand out clearly. Ruled lines of varying shades, colors and number may also help to group information.

The spacing of the information is also important. The length of the line should not exceed three or four inches so the eye travels the entire length easily. The proper spacing should be planned for filling in the information by typewriting, by handwriting or by checks (✓), although the latter is more apt to be inaccurate.

The firm name and printer's form number should be printed in small type in the lower left hand corner for purposes of identification and also for convenience in re-ordering stock. Do not place the firm name in large print at the top of a card which is the most valuable filing space and should be retained for more important information.

#### Adjustable Indicators

One arrangement of cards may be kept, as for instance the alphabetic, and yet indicate several classifications, by using tab cards, colored cards or signals. A list of employes may be kept in one alphabetic list by surnames—the men listed on white cards and the women on blue cards. A salesman has a card which he fills in with all the necessary information regarding a prospective customer. On the upper left hand corner is a tab bearing the word "Prospect." Customers and prospects are filed in one alphabetic arrangement so that there is no embarrassing wait when a caller by phone or in person announces his name. When the prospect buys, the salesman clips off the "prospect tab," and no time or money is wasted in copying the cards, nor is there a chance for errors in transcribing. The policy holders' records in an insurance company may be kept on tab cards, which are alphabetically arranged by the name of the policy holders, the tabs representing the months of the year. If a policy expires in January, it is written on a first position tab card bearing the name of that month: February has a second position tab and the succeeding months follow in consecutive order—December occupying the tab at the extreme right. On the tab just below the month is a small round hole. In December, when time comes to send notices to the policy holders whose policies expire in January, the clerk runs a long stiff wire through the January tabs and lifts them from the file, placing a cork on each end of the wire. The typist sends the notices without disarranging the cards. The cards may easily be consulted at any time and are sorted ready to go back into the files as fast as the notices are sent.

If several classifications which are to be chosen from a possible ten are wanted on one card, a card may be purchased with ten tabs, numbered or named as desired, and all but the desired tabs may be cut off when the card is filled in. There are also celluloid signals in colors, numbered, lettered, or wide

enough to insert a word, which may be pasted on the top of cards to give the desired classification.

There are metal tip signals in varying colors which may be had for the months, days of the week, or bearing letters or numbers. These slide over the top of the card and permit a changing classification. The daily movement of cars may be traced across a card in railroad offices by means of such signals.

Wall maps or maps used in shallow flat drawers often supplement card indexes especially in sales records and in campaigns. Colored pins placed on the towns indicate the places where items are sold or propaganda has been undertaken. The routings of salesmen or speakers may be traced by means of colored yarns attached to the map in much the same style that campaigns were followed on maps during the war.

#### Distribution of Guides

Guides for card indexes may be had in metal tip or celluloid tubes for inserts, or in the flat celluloid or plain tab guides for all standard sizes and in varying colors. Alphabetic divisions ranging from 25 to 5000 divisions, consecutive numbers, states, cities and other classifications may be purchased. The guide tabs are cut in thirds, fourths, fifths, and halves. There should be a guide for every twenty-five or thirty cards to insure both accuracy and speed in handling the cards.

#### Visible Files

The visible files are more advantageous for many short lists where quick reference is needed than are cabinet files. They provide for cards of varying sizes and offer the same advantages in special classifications for both temporary and permanent use as described above, by means of colored cards and signals.

If all card records as well as the files for correspondence and data are placed under the supervision of a competent, trained file clerk who attends to the making and filing of all records, there will be continuity in the filing, less unnecessary duplication of records, duplicates needed will be made when the original card is written, which saves time and money, and it will be easier to know where to locate special information. In large corporations the file clerks can go to the various departments perhaps twice a day, to collect information needed for the files and to add cards made to department files. Meanwhile the department files are in good shape for use, and are free from the mistakes that are sure to occur when a busy office boy or private secretary tries to make and tuck cards away in the file during chance leisure moments.

#### APRIL 15th FRONTISPIECE

In response to an inquiry concerning our April 15th frontispiece—a fine picture of the High Sierras near the Southern California Edison Company's Big Creek system—we are pleased to give credit to the photographer, Mr. G. Haven Bishop.

Mr. Bishop is also responsible for a number of the photographs used as illustrations to the Water Power Report appearing in this issue, and for the illustrations to the article by Mr. Brackenridge.



# The Oldest Central Station in the World

BY FRANK B. RAE

(Of great historic interest is the following account of the world's first central station, described by an engineer who was connected with the company from its earliest days. The details of the plant construction and illumination designs illustrate with exceptional vividness the vast strides which electrical development has made since its not very distant pioneer days.—The Editor.)



The San Jose tower, built in 1881 to supply the city with the "moon-light" illumination. It was necessary to make certain modifications in this structure later.

OMETIME about 1876-7 the California Electric Light Company was organized, and under the direction of George Roe, as secretary and general manager, established the first central station in the country, antedating the stations of Cleveland and elsewhere in the East by some months. This first station building was a brick structure about 25 x 40 feet, located on the rear of a 50-foot lot on O'Farrell street, San Francisco, an old wooden residence on the street front serving as offices.

## Power Plant Equipment

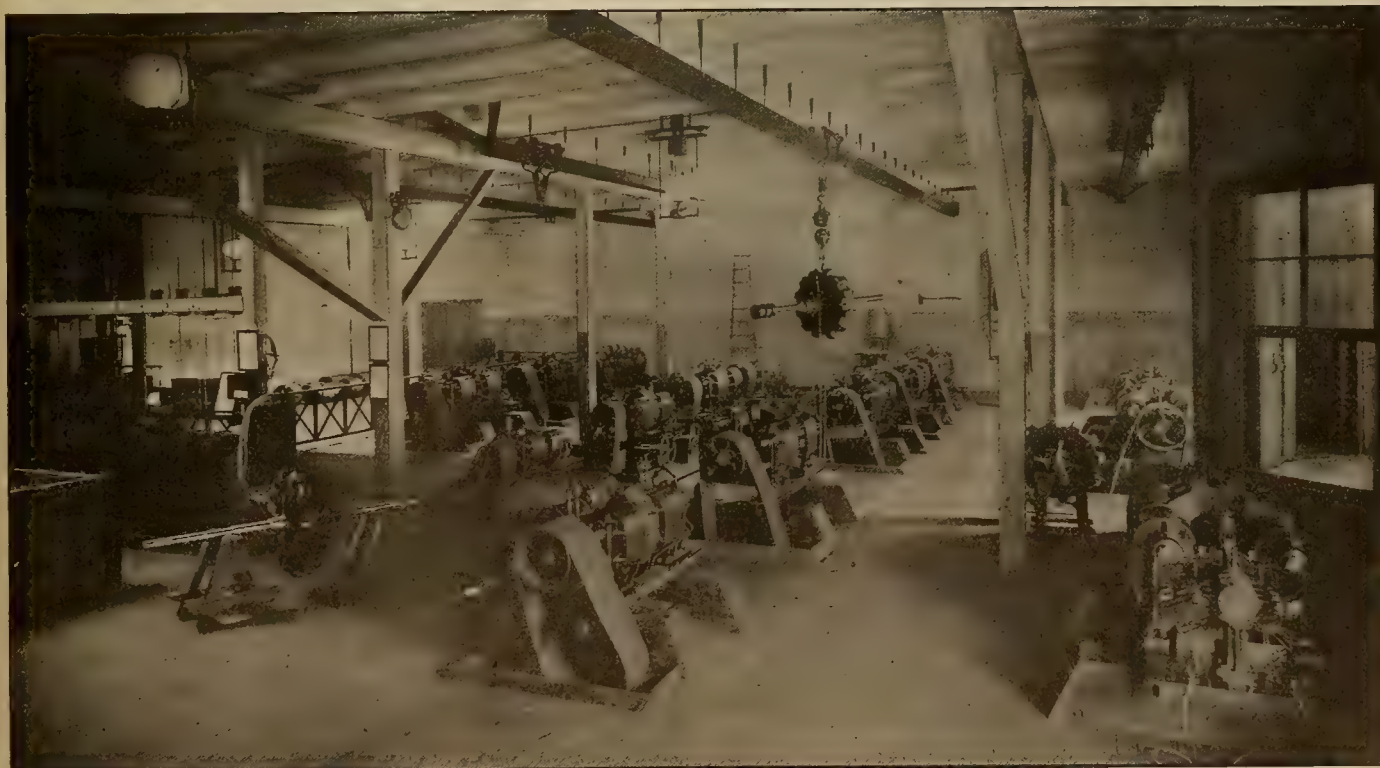
The power plant consisted of one tubular boiler of about 60 hp. as nominally rated, and a slide valve engine of the saw-mill type of possibly 50 hp. at some point of cut-off. The engine was belted to a counter-shaft which in turn was belted to the dynamo.

The electrical installation included one Brush 16-light and one Brush 6-light dynamo; the sixteen-light machine being the largest that the Brush Electric Company of Cleveland, Ohio, had developed up to the time this station was constructed.

There was no switchboard, but each machine was connected to the outgoing circuit through a single-pole switch and a current indicator erected at any convenient location. There was also a regulator for the generator consisting of carbon resistance blocks adjusted by a solenoid magnet and weight which was supposed to maintain a constant current on the lamp circuit. If, however, the machine circuit contained less than its complement of customers' lamps, the lamps necessary to give the machine its full load were connected in the circuit within the station.

## Wiring Arrangements

The lamp circuits were run over the housetops with insulated wire known as "Underwriter's" wire; the insulation consisting chiefly of asbestos paint, supposed to be fireproof and therefore safe. The wire was supported on pony glass insulators and brackets, the latter being nailed to the roof cornices at any convenient place. When all of the customers' lamps were connected to the outgoing wire, the circuit was completed by a connection to the first available water or gas pipe, a similar connection being made from the generator terminal at the station.



This plant, dating from 1880, was built in San Francisco by the California Electric Light Company, predecessor of the Pacific Gas & Electric Company. The picture shows the old type Brush generators, and at the extreme left the early form of switch-board.



The plant operated from dark until 10:30 p.m., exclusive of Sunday, supplying arc lamps in front of stores on Market street and on Kearny street for which the customers paid one dollar per lamp per night—approximately 40 cents per kw-hr.

### Street Illumination

Roe, primarily a central station man, was very much interested in street lighting, believing this would ultimately become the chief source of revenue for the company. He expected to establish central station plants in other cities on the Pacific Coast and to secure from them the street lighting contract. The Brush Company of Cleveland had installed arc lamps on a high mast and the "moonlight effect" of lamps at high elevations was much discussed and generally was considered the coming system of street illumination. Roe was desirous of making a demonstration of this high supported, moonlight-effect lamp system, and for this purpose a Brush single-lamp dynamo and a 2000-c.p. arc lamp were shipped to Nevada City. The demonstration was made with the lamp suspended on the dome of court house, and Nevada City was more or less illuminated, but just why a central station and a city lighting contract did not result has been forgotten. It is not recalled that the company had, up to the fall of 1881, placed any apparatus for lighting manufacturing plants or for other commercial lighting, and the writer was sent north to endeavor to light up some of the sawmills on Puget Sound and in British Columbia. Several weeks of effort resulted in selling a 16-light machine and lamps to a mill located on an island near Seattle, and a 5-light outfit to a mill at Berry Inlet in British Columbia.

### Price Schedule

The schedule of prices as fixed by the California company was extremely simple; there were three things to sell—generators, lamps, and carbons. There were no discounts, no commissions or resale quotations, and the base price for each item was based on a decimal system, as follows:

Dynamos—per light capacity.....	\$100.00
Lamps—each .....	100.00
Carbons—per 1000 .....	100.00

All f.o.b. Cleveland, Ohio.

(Continued on page 527)

## COMMISSION REGULATION OF ACCOUNTING SYSTEMS

To ascertain to what extent the accounting systems of municipally owned and privately owned public service companies, especially central stations, were controlled by the public service commissions of the various states, the Journal of Electricity sent out the following questionnaire:

Public spirited men have stated that there should be uniformity in the accounts of municipally and privately owned systems, particularly electrical utility companies; that the various state regulatory bodies should be empowered by law to see to it that all central stations within the confines of the commonwealth they serve should have a uniform system of accounting. We believe this to be a fact, and desire to find out to what extent your regulatory body has control of these matters by the following questions:

1. Does your commission have the power to control the accounting systems of the central stations in your state?

2. Does your commission have the power to institute a uniform system of accounting for municipally owned as well as privately owned central stations?
3. If not, does your commission believe that such a system of uniform accounts would be fairer to both the companies and to the public?

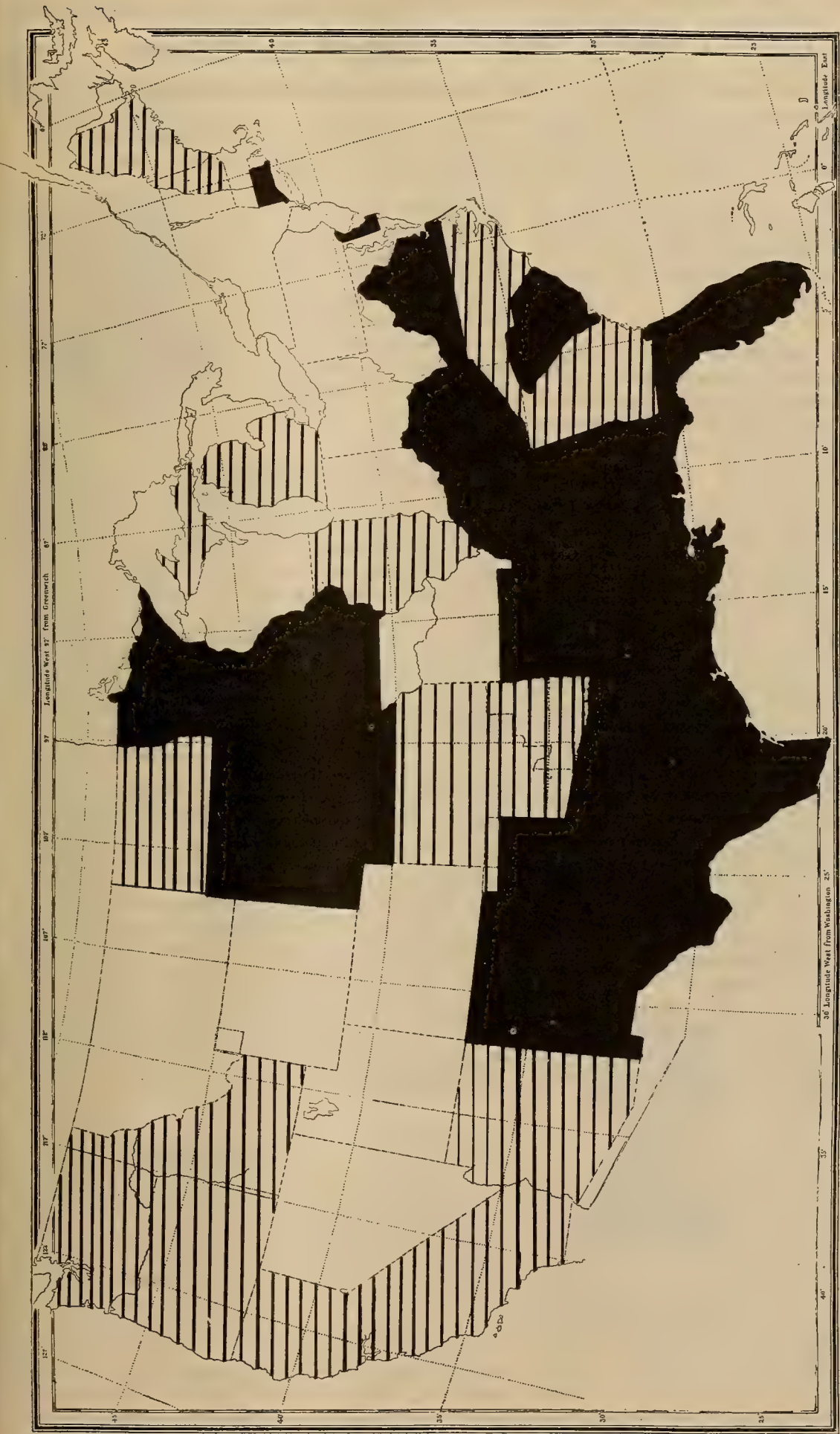
Results of this questionnaire are here tabulated:

State	Ques. No. 1	Ques. No. 2	Ques. No. 3	Remarks and Authority
Alabama	.....	.....	.....	No state regulation
Arizona	Yes	No	Yes	No state regulation
Alaska	.....	.....	.....	Sec. of Commission
Arkansas	No	No	.....	.....
California	Yes	No	Yes	E. O. Edgerton, Pres.
Colorado	Yes	Yes	Yes	Sec. of Commission
Connecticut	No	No	Yes	Sec. of Commission
Delaware	.....	.....	.....	No state regulation
Florida	.....	.....	.....	No state regulation
Georgia	Yes	No	Yes	Sec. of Commission
Hawaii	Yes	No	Yes	Wm. T. Carden, Chairman
Idaho	Yes	No	Yes	Sec. of Commission
Illinois	Yes	No	.....	Commission has never considered this question (3d)
Indiana	Yes	Yes	Yes	E. J. Lewis, Commissioner
Iowa	No	No	Yes	Sec. of Commission
Kansas	Yes	No	Yes	Sec. of Commission
Kentucky	No	No	Yes	Sec. of Commission
Louisiana	.....	.....	.....	No state regulation
Maine	Yes	No	Yes	Benj. F. Clemen, Chairman
Maryland	Yes	Yes	Yes	Except for the city of Baltimore, B. F. Fendall, Sec.
Massachusetts	Yes	Yes	Yes	A. R. Weed, Commissioner
Michigan	Yes	No	Yes	William M. Smith, Chair.
Minnesota	.....	.....	.....	No state regulation
Mississippi	.....	.....	.....	No state regulation
Missouri	Yes	Yes	Yes	Sec. of Commission
Montana	Yes	Yes	Yes	W. S. Haynes, Sec.
Nebraska	No	No	Yes	Sec. of Commission.
Nevada	Yes	Yes	Yes	J. F. Shaughnessy, Chair.
New Hampshire	Yes	No	Yes	Wm. T. Gunnison, Sec.
New Jersey	Yes	Yes	Yes	A. N. Barber, Sec.
New Mexico	No	No	Yes	Sec. of Commission
New York—	.....	.....	.....	.....
Dist. No. 1	Yes	Yes	Yes	James B. Walker, Sec.
Dist. No. 2	Yes	Yes	Yes	Sec. of Commission
North Carolina	Yes	No	.....	Commission has not required this (2) except for reports.
North Dakota	Yes	No	Yes	.....
Ohio	Yes	Yes	Yes	C. C. Marshall, Chair.
Oklahoma	Yes	No	Yes	W. E. Grimes, Auditor
Oregon	Yes	No	Yes	Ed. Wright, Sec.
Pennsylvania	Yes	Yes	Yes	Sec. of Commission
Porto Rico	Yes	Yes	Yes	F. L. deHostos, Sec.
Rhode Island	Yes	Yes	Yes	Sec. of Commission
South Carolina	No	No	Yes	S. B. Earle, Sec.
South Dakota	.....	.....	.....	No state regulation
Tennessee	.....	.....	.....	No state regulation
Texas	.....	.....	.....	No state regulation
Utah	Yes	Yes	Yes	Sec. of Commission
Vermont	Yes	Yes	Yes	Sec. of Commission
Virginia	No	No	.....	Sec. of Commission
Washington	Yes	No	Yes	J. H. Brown, Sec.
West Virginia	Yes	Yes	Yes	Sec. of Commission
Wisconsin	Yes	Yes	Yes	Sec. of Commission
Wyoming	Yes	Yes	Yes	Sec. of Commission
Manitoba, Canada	Yes	Yes	Yes	A. W. Smith, Sec.
Totals—YES	35	20	39	
NO	12	33	0	

It should be noted that none of the answers to the third question were in the negative, and although some of the commissions neglected to fill out this question it is taken for granted that such an action either means that the commission did not wish to commit itself or that the answer to the second question made an affirmative answer to the third question superfluous.

No broad-minded man will deny that a uniform system of accounts for municipally owned and privately owned public service companies would be fairer to both the companies and to the public. For with different accounting systems there are bound to be different segregations of expenses that will affect materially the earnings of the company. Since the Journal of Electricity has shown the need of such legislation in the majority of the states it is to be hoped that steps will be taken that will insure uniform accounting systems to all public service companies in a state, no distinction being made between municipally owned plants and those owned by private capital.





Here are the results of a nation-wide questionnaire sent out to regulatory bodies of the forty-eight states, from whom unanimous answer has been received. The white portion on the sketch indicates that such states have unified accounting systems under commission control for both privately owned as well as municipally owned utility institutions. The cross hatch indicates that the privately owned utilities are under the direct control of regulatory bodies, with the regulatory body having authority to institute unified accounting systems; while the black indicates that neither privately owned nor publicly owned systems of accounts

are unified or standardized under enactment of the state; hence utility companies in such states are absolutely without legal authority for unification of accounting systems. What a powerful impression to the mind it conveys when we see as combined the cross hatched states, and the states in black, existing today without unification of accounting systems for both privately owned as well as municipally owned utility companies. Forceful comment is to be found on this questionnaire by referring to the editorial pages of this issue of the Journal of Electricity.



## SPARKS—Current Facts, Figures and Fancy

(What is the horsepower capacity of your will? Do you want a good excuse for buying a new hat? Do you know anything about washing machines in Greece, movies in Norway, or safety-pins in Trinidad? Items on these and other subjects of equal interest are collected here for the reader who is tired of thinking consecutively.—The Editor.)

It seems that Japan is adopting in full force the policy, "It pays to advertise." Plans are now being made to fit up a 10,000-ton steamer as an exhibition place for Japanese products, and send it around the world to advertise Japanese wares.

\* \* \*

The recent war emergencies proved certainly that necessity is the mother of a new industry. Before the war, not an ounce of optical glass was made in the United States, but long before its close this country was producing that material at the rate of twenty tons a month.

\* \* \*

The importance of any industry is measured as much by the amount it consumes as by the amount it produces. It is interesting in this connection to note that the electrical industry in normal times uses from sixty to seventy-five per cent of the entire copper output of the world.

\* \* \*

The most valuable type of power has thus far never been measured and so it is with interest that the scientific world welcomes a recent invention of Professor Sidney Alrutz of the University of Upsals, Sweden. Professor Alrutz asserts that he has devised an instrument which will measure the definite amount of power exercised by the human will. Never before has science been able to announce an invention of such vital and personal interest.

\* \* \*

Motion-picture theaters are being conducted as a municipal enterprise in a Norwegian city. In this community of 100,000 an average of \$6.50 for each man, woman and child was spent at motion-picture houses. Nine-tenths of the films shown are of American origin, wild west, mining camp, logging camp, and Alaskan pictures predominating. The other tenth is made up of Swedish and Danish films, with an occasional German or Norwegian film.

\* \* \*

Safety pins are surprisingly popular among the inhabitants of Trinidad. Reports show that about \$1000 worth of safety pins are sold on the island per year. Especially remarkable is the demand for safety pins of rolled or solid gold, some of the latter ranging from \$1 to \$5 in price. Not only are these used widely among women for purposes of ornament as well as utility, but they are also displayed by men in connection with soft collars and scarfs.

\* \* \*

Even the "smoke nuisance" from large industrial plants and smelters is being abated through the

use of electricity. The small particles of fume and smoke which are held in suspension by the gas passing through the flue are given the same charge as the wire and are either attracted to the pipe and held there, or are attracted to each other, forming masses which are heavy enough to fall by gravity to the hoppers underneath. The pipes are relieved of their load by being periodically beaten with hammers, either electrically or by the hand.

\* \* \*

Many and varied are the sources from which alcohol has been extracted from time to time, and so we are not altogether surprised to hear of the late British announcement that alcohol can be extracted from coke-oven gas. Practical work shows an average yielding of 1.6 gallons of alcohol per ton of carbonized coal. From this it is estimated that the recovery of alcohol at the gas works of England would yield some 27,000,000 gallons, while the recovery of alcohol and benzol, taken together, would amount to 114,000,000 gallons, to meet the requirements of the country, which amount to 160,000,000 per annum.

\* \* \*

Some day every American home will have a washing machine, of course, and still the field for sales will not be closed. Reports come that great interest has been aroused in the American washing machine even on the Isles of Greece. Its advent has electrified the good wives of that locality who for centuries have washed clothes without soap and by a peculiar process of their own. At a demonstration where washing machine operations were displayed before several hundreds of these women, there was a babel of Greek amazement when the clothes were pulled out white and clean. The women fought to examine the machine and to turn the crank at the second demonstration.

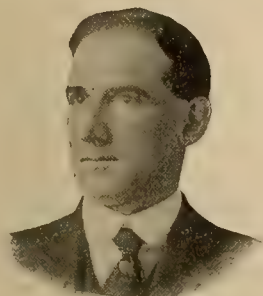
\* \* \*

It is with mingled feelings of joy and sorrow that we welcome a recent statement to the effect that, after all, we should not put forth undue effort to cut down the H.C.L. A doctor of the London Institute of Hygiene states that "a new hat may have a greater curative and stimulative value than any tonic purchased at the drug store." It is this doctor's theory that when mentally and spiritually at a low ebb, one should try the "dress cure" and see what buying something new will do. The psychological effect which will be produced is estimated so highly, in fact, that even the selling of some so-called ornaments is advocated, if necessary to obtain the money for the therapeutic new frocks and hats.



## PERSONALS

**Frederick G. Cottrell**, assistant director of the United States Bureau of Mines, has been nominated by President



Wilson as director of the Bureau of Mines to take the place of Dr. Van H. Manning, who has resigned from that position. Dr. Cottrell is well known as an inventor as well as a chemist and metallurgist. He is a Western man, being a native of the city of Oakland and a graduate of the University of California. After receiving degrees as Master of Arts and Doctor of Philosophy at the University of Leipzig, Dr. Cottrell

taught chemistry at the University of California, at which time he did considerable research relating to the electrical precipitation of fume and fine particles suspended in the gases of smelter, blast furnace or cement works flues. Here he evolved what is known as the Cottrell process now in worldwide use. Aside from his work on smelter smoke Dr. Cottrell has been deeply interested in and intimately connected with work on the separation and purification of gases by liquification and fractional distillation. During the world war and subsequently thereto the development of the Norton or Bureau of Mines process for the recovery of helium from natural gas has been his special care, and it was chiefly through his efforts that a plant for recovering helium, a rare non-inflammable gas, on a large scale for military aeronautics, has been erected near Petrolia, Texas. Dr. Cottrell is a member of the American Chemical Society, Mining and Metallurgy Society of America, the American Electrochemical Society and the American Institute of Mining and Metallurgical Engineers. He was awarded the Perkin medal by the New York Section of the Society of Chemical Industry in 1919 in recognition of his work on electrical precipitation.

**F. E. Newberry**, of the F. E. Newberry Electric Company of St. Louis, has been visiting on the Pacific Coast.

**O. E. Estoff**, vice-president of the H. M. Byllesby Company of Chicago, has been in the West lately on a business trip.

**H. C. Rice**, manager of the General Incandescent Lamp Company of Cleveland, Ohio, is a recent San Francisco visitor.

**G. O. Noble**, manager of the Westinghouse Electric & Manufacturing Company, Los Angeles, is a recent San Francisco visitor.

**J. J. teKaat** of the General Electric Company, with headquarters in Sourabaya, Java, recently passed through San Francisco.

**W. H. Onken, Jr.**, editor of the Electrical World, is spending a short time on the Pacific Coast previous to attending the Pasadena conventions.

**C. W. Whitmore**, president of the Chamber of Commerce in Buenos Ayres, arrived in San Francisco last week to attend the Foreign Trade Convention.

**L. S. Rowe**, chief of the Latin-American division of the State Department, has been elected director-general of the Pan-American Union. Dr. Rowe will succeed John Barrett who will retire on the first of September.

**T. W. Snell**, formerly assistant electric superintendent of the Redwood district of the Pacific Gas & Electric Com-

pany, is now with the Coast Valleys Gas & Electric Company as superintendent of construction, with headquarters at Salinas.

**A. M. Perry**, engineering editor of the Electrical World, is visiting the Pacific Coast after a tour through the Northwest in the interest of Electrical World and the McGraw-Hill Company. Mr. Perry spent some time in San Francisco previous to attending the N. E. L. A. conventions. He is accompanied by his wife and daughter.

**J. W. Roberts**, of the New York office of the Western Electric Company, is a recent San Francisco visitor. Mr. Roberts is a traveling auditor for the Western Electric Company and is doing work in the West both for that company and for the Northern Electric Company, Ltd. Having already visited southern California, Mr. Roberts plans to go from San Francisco to Seattle and then on through the Vancouver district from where he will return to the New York office.

**A. E. Wishon**, assistant general manager of the San Joaquin Light & Power Corporation and president of the Pacific Coast Section N. E. L. A., has returned from a trip to the East which he made for the purpose of delivering a number of addresses on his renowned Self-Interest Story. Mr. Wishon spoke before the Eastern leaders of the electrical industry and at every meeting was received with enthusiasm. Mr. Wishon spent a few days in San Francisco previous to his return to Fresno.

**J. C. Martin** has been appointed Western Editor of the Electrical World with headquarters at Chicago, succeeding Mr. W. H. Spake. Mr. Martin was formerly chief engineer of the Pacific Power and Light Company at Portland, Oregon, and left that position to become chief engineer of the Lehigh Valley Light and Power Company and its subsidiaries at Allentown, Pennsylvania. Mr. Spake will go to New York as assistant to Mr. Lewis of the Business Department of McGraw-Mill Company.

**W. L. Goodwin**, of the General Electric Company, has come from New York to visit California until the last of July. Mr. Goodwin, who has done more than any other member of the electrical industry in promoting the Electrical Cooperative Campaign, had a significant message to give to the men of the West in his addresses on the Goodwin Plan which he has delivered in San Francisco and Pasadena. During the month of July, Mr. Goodwin plans to spend his vacation in the mountains of California.

**D. W. Henderson**, who had been superintendent of transportation of the Seattle municipal street car lines since they

were purchased by the city in April, 1919, has been appointed General Superintendent of Railways by Mayor Hugh M. Caldwell of Seattle. The appointment has met with universal approval, due in a great measure to the proved fitness of Mr. Henderson for the position. He began his street railway career as a motorman in the employ of the Seattle Electric Company eighteen years ago. Appointed an inspector in 1907,



he was appointed to the position of assistant division superintendent of transportation in 1911. He acted as a division superintendent from May until November, 1912, when he was appointed superintendent of transportation. He served in that capacity for the Puget Sound Traction, Light & Power Company of Seattle until the railway lines were purchased by the city in 1919. The present position carries a salary of \$5,000 a year.



A. L. Kempster, traction manager of the city of Seattle, has been named general manager of the New Orleans Rail-



way and Light Company to succeed John S. Bleecker who has resigned from that position. The local lines are now in the hands of a receiver, and it will be the new general manager's duty to put them on a solvent basis in as short a time as possible. Mr. Kempster holds a big reputation as a railway man, and it is expected that he will be entrusted with the task of breaking up some of the most serious traffic problems that

have ever occurred in any city, one of which is trying to handle 400,000 persons with the same cars that moved 300,000. Previous to his appointment as Seattle traction manager, Mr. Kempster was manager of the Seattle division of the Puget Sound Traction, Light & Power Company. Mr. Kempster will probably return to Seattle when the receiver for the New Orleans street railway is discharged. A year ago he performed a similar service when he was asked to go to Brooklyn in an advisory capacity for the Interborough Rapid Transit Company, returning to Seattle when his work was accomplished. He was invited to look over the situation at New Orleans, and left for there a week ago. Mr. Kempster entered the street railway industry on November 10, 1891, as an office boy with the consolidated street railways of Seattle. He became an accountant, then auditor and secretary of the consolidated, and when the Seattle Electric Company was organized, in 1899, he entered the operating department as trainmaster of the system. From there he went to superintendent of transportation, then general superintendent and finally manager. He is married and resides at 515 Twenty-second Avenue North, Seattle.

H. H. Randall, of the Capital Electric Company of Salt Lake City, visited San Francisco recently.

Floyd Averill, Fobes Supply Company, Portland, Oregon, spent a few days in San Francisco on business recently.

C. R. Hennerick, Western Electric Company, has been transferred from Atlanta, Georgia, to the San Francisco offices of the company.

A. S. Lindstrom, of San Francisco, has been appointed as one of the four new agents and representatives for the Greaves-Etchells Electric Furnace Construction Company.

J. O. Case, sales manager for the Los Angeles district of the General Electric Company, recently made an extended trip in the East, where he visited all the important offices and factories of his company.

L. E. Newberry of the Newberry Company, prominent contractor-dealers of Chicago, St. Louis, San Francisco and Los Angeles, who usually has his headquarters in Chicago, Illinois, is a recent Pacific Coast visitor.

Edward Woodbury, until recently electrical fabrication engineer of the American International Shipbuilding Corporation at Hog Island, has been transferred to the Pacific Coast where he will be in charge of the field work, installing the electrical equipment at the new Caribou plant of the Great Western Power Company which is being constructed by Stone and Webster.

J. A. Vandegrift, general sales manager for the Pacific Coast of the National Lamp Works, has just completed a trip to the principal business cities of the West together with M. G. McKitterick, general sales manager, Paul F. Bauder, sales manager of the Miniature Lamp Department, and P. B. Zimmerman, manager of the publicity department of the National Lamp Works. He has held conferences with National

"B" agents in Seattle, Portland, San Francisco and Los Angeles.

Samuel A. Chase, Westinghouse Electric and Manufacturing Company and Harry Kirkland, General Electric Company, were two of the principal speakers at the "get together" dinner of the California Electrical Cooperative Campaign held in the Commercial Club at San Francisco on the fifth of May. In company with W. L. Goodwin, Mr. Chase and Mr. Kirkland have been speaking in the large electrical centers on their way to the N. E. L. A. Convention.

R. M. Woolley, of the United States Geologic Survey, has been compiling data on the unexploited power resources in the Great Salt Lake Basin. Mr. Woolley reports that at present there are fifty power plants in the basin generating 160,000 horsepower. He has made the recommendation that the 145,000 horsepower now going to waste be utilized.

M. T. Crawford, superintendent of distribution, Puget Sound Power & Light Company, Seattle, has returned from a six weeks' tour through the larger centers of the East and South, studying underground transmission, both d.c. and a.c.

J. B. Campbell, of Springfield, Illinois, has purchased the power plant and business of the Morton Electric Company of Morton, Washington, from C. S. Hagerty, formerly of Tacoma. The plant is situated on the Tilton river about one mile west of the town. Mr. Campbell intends installing an electrical supply store in connection with the business.

J. P. Lottridge, general manager of the Eastern Oregon Light & Power Company, which serves both Baker and Union counties, returned Thursday from Milwaukee and Chicago, where he had a most satisfactory conference with the directors and bankers interested in his company. At the meeting it was decided to erect a steam plant at La Grande which will cost approximately \$200,000, and before returning home Mr. Lottridge made all arrangements for machinery equipment. He also arranged for an improvement of the gas plant in Baker and the machinery was purchased, some of it now being on the way to that city.

Carl H. Reeves has been appointed superintendent of public utilities by Mayor Caldwell of Seattle, succeeding

Thomas F. Murphine. Major Reeves has been a resident of Seattle for the past twenty-seven years and has long been engaged in engineering work in connection with the street railways, and on construction of city utilities. He served in the office of the city engineer for several years prior to 1906, and while serving in that capacity, designed much of the city's sewer system and other municipal projects. From 1906



to 1916 he was assistant engineer with the Seattle Electric Company, resigning in 1915 to perform special work for the State Public Service Commission, after which he took up private practice. He was the first engineer officer called from Seattle to active duty assignment in the Engineer Corps, directing engineering work at Camp Fremont, California at Puget Sound forts, Camp A. A. Humphreys, and other camps throughout the country. After serving 23 months he was discharged as a major, June 4, 1919.

#### OBITUARY

Henry Dorr, manager of the Garden City Electric Company of San Jose, and a member of the executive committee of the California State Association of Electrical Contractors and Dealers, died suddenly at his home in San Jose a short time ago.



## Meeting Notices for Electrical Men

(A record-breaking meeting of the California Cooperative Campaign, addressed by the leaders of the cooperative plan in the electrical industry, is recorded here along with a complete report of the Visalia meeting of the California Association of Electrical Contractors and Dealers, and notices of A. I. E. E. and Contractor-Dealer activities in the Northwest and Utah.—The Editor.)

### California Cooperative Campaign Dinner

When W. H. Goodwin stood up to speak at the dinner of the California Electrical Cooperative Campaign at the Commercial Club in San Francisco on the evening of May 5th, the three hundred and fifty contractor-dealers, jobbers, manufacturers agents and central station men who had gathered there to greet "Bill" and listen to his message of proper methods of merchandising, stood on their feet and cheered him long and loud. Lee H. Newbert, chairman of the advisory committee of the campaign was toastmaster and prior to the speech of Mr. Goodwin introduced the other speakers on the program.

A. Emory Wishon, president Pacific Coast Section N. E. L. A., the first speaker of the evening, spoke of his trip east and once more brought home to the men of the electrical industry of the West the importance of their preaching the "self interest story" to the men of the East when they meet them at the Convention at Pasadena on the twenty-first of this month.

Harry Kirkland, of the General Electric Company, was the next speaker and told of the need of better merchandising methods on the part of the electrical dealer. Mr. Kirkland presented a series of interesting figures showing the activities of the manufacturers during the present year, some of these figures showing enormous increases in production. The summary of the activities might be illustrated by the fact that there will be 14,030,000 attachment plugs and snap switches manufactured in 1920.

Samuel A. Chase of the Westinghouse company was then introduced and spoke of the spread of the cooperative movement through the East and the results obtained by the spread of this gospel of "live and help live" where the contractors, dealers, manufacturers, jobbers and central station men were all speaking a common language of cooperative competition instead of destructive competition.

"Merchandising," was the subject of the talk given by Mr. Goodwin and in his usual convincing manner he told the contractor-dealer that while California is practically the leading state in cooperative movements, the one thing the electrical industry needs is capital that will enable the central station to extend their lines. Mr. Goodwin went on to point out that in competition with the ten per cent return offered by real estate the little eight per cent offered by the central station would not attract the man who had money to invest but that it was necessary for the electrical men to show their belief in their industry by investing in central

station bonds and stocks. In pointing out the road to better merchandising methods Mr. Goodwin urged the use of the trade journals, the use of liberal and intelligent advertising, and modern methods of salesmanship. The store was discussed next, including its location, appearance inside and outside and the proper use of the windows for the display of goods. The talk was full of excellent ideas that went home as each man present saw the weak points in his own organization and the remedy for them.

The San Francisco Electrical Contractors and Dealers had a large table to themselves as did the East Bay Association and during the dinner each group tried to outdo the other by different stunts. The music was furnished by a jazz orchestra that played all of the familiar songs and the members joining in and singing between courses.

### Montana Contractors and Dealers Form Association

The electrical contractors and dealers of Montana held a meeting in Butte on April 24th and 25th to form an Association which will be known as the Electrical Contractors and Dealers Association of Montana. Constitution and by-laws were adopted and many other business matters attended to during the Convention. Application has been made by the Association to become affiliated with the National Association of Electrical Contractors and Dealers. Mr. J. C. Curran of Helena was elected President and E. Downing Secretary and Treasurer of the Association. An executive board was also

elected which consists of Joseph Olson of Great Falls, Carl Miller of Kalispell, O. C. Langstadt of Butte, and A. A. Nicholas of Billings. The next meeting of the organization will be held in Great Falls in October of this year.

### Seattle Section, American Institute of Electrical Engineers

The regular, monthly meeting of the Seattle Section of the American Institute of Electrical Engineers held on April 20th, was of unusual interest. Three papers were read before the Section. One of the papers was entitled, "New Features of the Cedar Falls Pipe Line," by Mr. F. R. Nicholas, Locating Engineer for the Seattle Municipal Lighting Department, W. J. McKean, Engineer of Construction, Seattle Lighting Dept., spoke on "New Features of Power House Design," and the third paper by Mr. Glenn H. Smith, Engineer of Outside Construction of the Seattle Municipal Lighting Department, was "A New Plan of Distribution."

The three speakers discussed the special features that are being embodied in the construction work now under

### BUILDERS OF THE WEST — LXXVII



E. O. EDGERTON

Today no one has greater opportunity for service than those who have it within their power to establish just and reasonable rates and returns for utility companies throughout the nation. The country as a whole owes a deep debt of gratitude to men of vision who have been able to sense the possibility of good to the public, and progress to the nation, in the awakening of the highest ideals of service, and in setting up at the same time reasonable rewards for sincere effort put forth. E. O. Edgerton, President of the California Railroad Commission, is today awakening in the hearts of his fellow citizens new and healthy ideals for progress and service to the public, and to him this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to the magnificent work he is accomplishing.



way or contemplated in the immediate future by the Lighting Department of the City of Seattle. Some of the ideas involved radical changes in regard to engineering, and were of unusual interest, causing considerable discussion of the papers.

At the May meeting of the Section Mr. H. J. Shepard, District Plant Engineer of the Pacific Telephone and Telegraph Company, will present a paper on "Methods Used in Laying Submarine Cables." This paper will be illustrated by slides and will set forth methods used by Mr. Shepard in laying long submarine cables of large diameter.

#### Visalia Meeting of California Association Contractors and Dealers

The regular meeting of the California State Association of Electrical Contractors and Dealers was held in Visalia on Saturday, April 24th. In the morning the executive committee held their meeting, the principal business being the consideration of twenty-nine applications for membership in the state association and the acceptance of the resignation of one of the members who had gone out of the business of electrical contracting. A letter was received from the Oregon Association of Electrical Contractors and Dealers in which they announced that there would be representatives from their association at the N. E. L. A. convention at Pasadena on May 21st. They further accepted the invitation of



Group of members and visitors at the Visalia meeting of the California State Association of Electrical Contractors and Dealers. The picture was taken in front of the Visalia Municipal Auditorium where the meeting was held.

the California Association to be present at its monthly meeting there on May 18th. A temporary assistant to the state secretary was appointed to act in the Southern California division.

#### New Section Formed

Two new sections were formed, Santa Barbara and San Luis Obispo, Mr. S. Bretherton being appointed to act as executive committeeman from the latter section. A letter was also received from the Vancouver, B. C. Association of Electrical Contractors and Dealers stating that they would be represented at the N. E. L. A. convention at Pasadena, and the May meeting of the California Electrical Contractors and Dealers and that while they had a real live cooperative campaign in their territory, they nevertheless wanted to get the California idea of the campaign and see if there were not some points that could be introduced in the Northwest that would increase the efficiency of their efforts.

#### Motor Section

At the meeting of the motor section presided over by J. A. Woods, of the California Mechanical and Electrical Engineering Company of Sacramento, the principal business was a letter from the Electrical Railway and Manufacturers Supply Company which contained drawings to be used as

a help to the contractors from small towns, in making motor installations. This letter was referred to the motor standardization committee, following a discussion of the standardization of wiring for motor installations. There being no further business the meeting was adjourned and the next meeting set for the 18th of May at Pasadena.

#### Retail Section

The meeting of the retail section was presided over by Louis Levy of the Levy Electric Company of San Francisco, with J. M. Gregory, secretary of the East Bay Electrical Trades Association acting as secretary. There were several speakers on the subject of advertising including H. W. Angus, secretary of the California Cooperative Campaign and James E. Baker of Bakersfield. Mr. R. D. de Journett, of M. C. Baker and Son, San Francisco, started a discussion on the best type of window display in which a great number of the members took part and told of the schemes that they had adopted in advertising their merchandise through window displays.

#### General Session

At the general session, the minutes of the executive session were read by secretary James W. Redpath, announcement being made of the new members and the formation of the two new sections.

Reports were received and accepted from the motor and retail sections and Mr. E. E. Brown of the standardization committee reported on the estimate sheets. No decision was reached and the members who had estimate sheets of their own were asked to send the name to Mr. Brown who would then prepare sheets to be posted at the next meeting where all of the members could have an opportunity to look them over before voting on the official form to be adopted by the association, which form would be accepted as official by the state association.

Mr. C. F. Butte was appointed to represent the State Association on the Executive Committee of the Pacific Coast Section N. E. L. A.. The next meeting of the association was set for May 18th at Pasadena, and the June meeting to be held in San Jose on the 19th.

After a Spanish dinner full of pepper, literally and figuratively, which had been arranged by H. H. Courtright, Valley Electrical Supply Company, of Fresno, a meeting of the association was held at which Mr. L. H. Newbert, chairman of the advisory committee of the California Cooperative Campaign spoke on the "Relation of the Central Station to the Contractor-Dealer." In his talk Mr. Newbert brought out the fact that the contractor-dealer was able to help out the central station man especially in the matter of complaints. It is possible by this kind of cooperation for the dealer to secure greater benefits from the campaign and he will find that the central station is only too willing to do all that it can to reciprocate.

Mr. R. M. Alvord, a member of the advisory committee of the Cooperative Campaign, spoke on "Better Service," pointing out that better service means better business and that all of the suggestions made by the campaign always meant better service. He showed that in bringing the dealer out of the alley to the main business stem, urging more courtesy in salesmanship, and the acceptance of the standard accounting system, in teaching the contractor modern methods in window display and by the convenience outlet campaign, the California Cooperative Campaign is merely teaching the meaning of better service.

All of the meetings were well attended and there were over one hundred members of the association present with a large representation of central station men, jobbers and manufacturers who are following the meetings of the contractor-dealers with a great deal of interest.



### Cooperative Convention—Vancouver

The Vancouver Association of Electrical Contractors and Dealers will hold its convention May 31st and June 1st. This association sends out an invitation to contractors, dealers, manufacturers, central station men and jobbers of the Pacific Coast to attend the convention. W. L. Goodwin, Samuel Adams Chase and Harry Kirkland will be at this convention and will address the meeting on various subjects which relate to cooperation.

The association secretary announces that Vancouver hotels are full and asks those who wish to attend the convention to secure accommodations early by writing.

### Utah Electrical Dealers Gather

Members of the Utah Society of Electrical Contractors and Dealers listened to an address by Harry B. Kirkland, of the General Electric Company, New York, on the evening of May 3rd at the Commercial Club. The title of the address was, "A Two-Billion Dollar Business." Samuel Adams Chase, Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., gave an address on "Results Obtained Through Adopting the 'Goodwin Plan.'"

Mr. Chase advocated the slogan of "Live and help live," instead of "Let and let live," as well as the slogan, "Cooperative competition" instead of "Destructive competition."

(Continued from page 520)

Neatly printed sheets of estimates of the cost of complete plants and cost of operation for possible central station installations, based upon the above prices for the electrical machines, were also used. These estimates were for plants ranging from 5 to 100-lamp capacity and it was shown very conclusively by them that a station of any size between these limits could be constructed and would pay dividends of from 20 to 40 per cent on the investment.

### First Central Station for Municipal Lighting

The first central station on the coast designed to supply street lighting to a municipality was constructed at San Jose in 1881-1882. It was modeled after the O'Farrell Street station but was somewhat larger. About this time, and in connection with the Cleveland mast lighting system, the Brush Company had produced a dynamo to supply lamps of 4000-candle power each. There was no doubt in the minds of the manufacturers about this quantity of light because it was shown that the current generated was twice as great as in the 2000-c.p. lamp machine, and also that the lamps had carbons that were twice the area of those used in the 2,000-c.p. lamps, hence the candle power rating of the new combination must be 4,000 c.p. One of these machines supplying five such lamps was installed in the San Jose station. During the station construction period, largely through the efforts of Editor Owen of the San Jose Mercury, citizens had contributed funds for the construction of a tower to support these high candle power lamps, from which the "moonlight effect" was to illuminate the city.

The San Jose station had two tubular boilers and a slide valve engine, countershaft, and so forth, all similar to the O'Farrell Street equipment, but in addition to the tower-lighting dynamo, contained a Brush 40-light machine which had been recently developed. This machine furnished current to the mast-arm lamps for street lighting and to the lamps of a few commercial customers.

William Lincoln Goodwin of the General Electric Company of Schenectady, N. Y., then addressed the gathering, giving a general talk on all problems of interest to all classes in the electrical industry and on scientific merchandising. He spoke on "Charting the Course for the Electrical Industry," illustrating this portion of his address with descriptive charts. He also described the "Goodwin Plan" of scientific merchandising, of which he is the originator.

Following the addresses of the speakers, who were introduced by George R. Randall, president of the Salt Lake organization, lunch was served by courtesy of the general Salt Lake jobbers.

### Everett Contractors Organize

Members of the Electrical Contractors and Dealers' Association of Snohomish county, Washington, met at Everett recently and adopted a constitution and by-laws. A committee composed of T. H. Erickson, chairman, S. O. Patterson and S. A. McCutcheon was chosen to meet with the committee from the electricians' union to discuss the proposed wage scale advance that became effective May 1. City Electrician Fred Rosco met with the association recently and took up with it the question of cooperation in the matter of securing a better quality of work in new construction jobs.

The tower, located at the intersection of Market and Santa Clara streets, was constructed of pipe, had a base spread of about 75 feet, and narrowed to about 5 feet at an elevation of 200 feet. There was an umbrella-shaped reflector at the top and underneath it the five lamps of 4,000 c.p. each (20,000 c.p.) were suspended.

It was expected that the entire city would be lighted with an intensity equal to full moonlight, and while the general effect in the outskirts was good, the vicinity of the tower, for a radius of several blocks, was almost totally dark.

To overcome this area of darkness, the writer designed a corner mast-arm lamp support to place a single lamp over the center of the intersecting streets. This arm arrangement was probably the first of its kind. It consisted of a pole top casting which supported extending pipes 16 feet long; a wire rope truss member helped to maintain the horizontal pipes in position and to support the lamp. Ropes running through the horizontal pipes, over pulleys on the pole top casting, served to lower the lamp for trimming, the connection with the circuit being made automatically when the lamp was hoisted to its position. Sixteen or eighteen of these mast-arm lights were necessary to dispel the gloom around the tower.

### Plant Expansion

In 1881 and 1882 the San Francisco station at O'Farrell Street became too small and a new, larger and more modern station was built south of Market Street. Other lighting systems were coming from the East—Edison, Weston and others, including the "divided" arc, as the incandescent lamp was sometimes called.

The great hydroelectric plants of the Pacific Coast of today show the progress of the industry for the 40 years that have elapsed since the O'Farrell Street station 16-light, 1000-volt dynamo supplied its customers' lamps over a roof-top circuit on a single wire and a gas-pipe return.



## Western Men of the N. E. L. A.



**R. H. BALLARD**

Vice-president and general manager of the Southern California Edison Company, and president of the National Electric Light Association.

It is fitting at this time that the entire electrical industry should express to Mr. Ballard its appreciation of his wonderful and untiring work as president of the National Electric Light Association. To his energy and vision is due in large measure the progress and cooperation which the past year has seen in the organization, and the enthusiasm which characterizes the great convention now gathered in the West.

**E. O. EDGERTON**

Mr. Edgerton, president of the California Railroad Commission, in which service he has been for the past six years, is a great power in the formulation of progressive thought on the subject of public utility regulation. Because of his attitude the utilities of California are now enjoying a condition of healthfulness which is being reflected throughout the West.

**F. M. KERR**

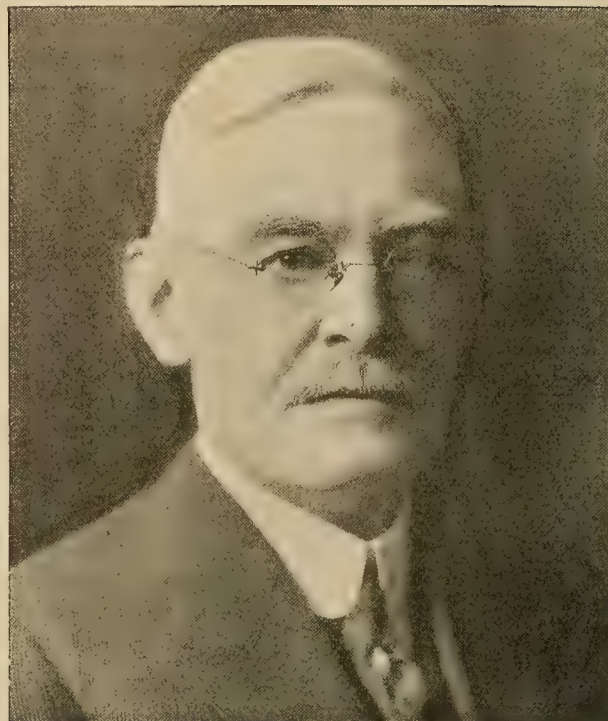
Mr. Kerr, vice-president and general manager of the Montana Power Company, who as chairman of the Railroad Electrification Committee will deliver the report of that committee, has come into close touch with the central station viewpoint of this problem through his interests in the Montana company which supplies a large share of the power for the electrification of the Milwaukee Railroad.

**F. T. GRIFFITH**

Mr. Griffith, president of the Portland Railway, Light & Power Company, will present to the convention the report of the Water Power Development Committee of which he is chairman. It is thought that this report will stand for years as the authoritative compendium of the legal and physical facts relating to this subject which is of such supreme importance to the West.

**S. M. KENNEDY**

Mr. Kennedy, vice-president and general agent of the Southern California Edison Company, has achieved such a pre-eminent position in the sphere of relations between the central station and its customers that he is thoroughly qualified to deliver his individual report on "Service" at this convention, as a guide to the highest type of practical idealism in public service.



**JOHN A. BRITTON**

Vice-president and general manager of the Pacific Gas & Electric Company, and chairman of the Public Policy Committee of the National Electric Light Association.

Few names are better known to the electrical industry throughout the nation than that of John A. Britton. As chairman of the Public Policy Committee of the National Electric Light Association he has applied to the affairs of the organization that sound judgment and clear-sightedness which have won for him the respect and admiration of all who have worked with him.

**J. B. FISKEN**

Mr. Fisken, chief consulting engineer of the Washington Water Power Company, will be the leading delegate from the Northwest to interpret to the convention the ideas and ideals of the Northwest Electric Light and Power Association. He has held the position of president of that association during the past year.

**J. B. MILLER**

Mr. Miller, chairman of the board and president of the Southern California Edison Company, who is acting as Convention Chairman, has exercised his unique ability so to organize his forces that results are accomplished without seeming effort, that this convention may pass into history as one of the most efficiently conducted ever recorded by the organization.

**L. H. NEWBERT**

Mr. Newbert, commercial manager of the Pacific Gas & Electric Company, will tell the convention of the development of the California Electrical Cooperative Campaign. As chairman of the Campaign committee Mr. Newbert has led in the movement to establish more firmly the use of electrical equipment in the home. This California idea has now spread over the whole country.

**A. E. WISHON**

Mr. Wishon, assistant general manager of the San Joaquin Light & Power Corporation, has just closed the most successful year of the Pacific Coast Section of the National Electric Light Association under his guidance as president. In addition to this accomplishment he has won national distinction in the extension throughout the country of his able "Self-Interest" appeal.



# HAPPENINGS IN THE INDUSTRY

## FINAL RATE DETERMINATION

Pending the final determination of the rates and charges to be collected by the Southern Sierras Power Company, the company will be allowed to collect from its consumers in the city of San Bernardino the same schedule of rates collected by the Southern California Edison Company, its competitor. The lighting rates of both companies were identical up to April 15th, when the Commission authorized the Edison company temporarily to increase its rates by 27%. Today's order was issued on application of the Sierras company, which has pending an application for a revision of its rates. The Commission says:

"For very substantial reasons the rates of these two companies, where they are in competition, should remain the same. A marked difference in rates, such as would result if this application be not granted, would cause a transfer of business from the high to the low rate company, thus imposing a burden resulting in a denial or breakdown of service. From every standpoint it is better that the rates of these two companies be kept on a parity in competitive territory, at least until final rate schedules are established."

## INCREASED COST OF CONSTRUCTION

An increase of approximately twenty per cent in the cost of labor and material, unexpected and unforeseen construction difficulties and a change in the power house plans are given by the Great Western Power Company of California as reasons for a stock issue of \$1,500,000 asked for in an application filed with the Railroad Commission. The company says that it will need the money raised through the proposed sale of its preferred stock to complete the Caribou plant on the north fork of the Feather River in Plumas county. According to the company's application the plant will cost \$1,924,670 more than the original estimate.

## SOUTHERN CALIFORNIA EDISON'S CONSTRUCTION BUDGET

The Railroad Commission has authorized the Southern California Edison Company to issue and sell \$5,000,000 of its general and refunding mortgage six per cent 25-year gold bonds. In an exhibit filed with the company's application for authority to make the bond issue it was shown that the company plans to expend from March 1, 1920, to December 31, 1920, \$8,505,000 to carry on hydroelectric development work and construct necessary transmission and distribution lines. Funds derived from the sale of the bonds are to be deposited in a special fund and expended only for such purposes as the Commission may authorize.

Among the proposed expenditures for development work are the following:

To complete Kern River No. 3 development.....	\$1,985,000
To carry on work at Big Creek including third unit at Big Creek No. 2, work on Shaver tunnel and reservoir, Pitman Creek tunnel and on Big Creek No. 8.....	2,108,000
To complete substation at Vestal (Richgrove).....	814,000
To complete Greenhorn transmission line from Kern No. 3 to Vestal substation.....	531,000
To complete change at Eagle Rock for increasing the capacity of that substation.....	312,000
To install additional steam turbine at Long Beach.....	420,000
To pay for necessary changes and increases in general transmission and distribution system.....	2,335,000
Total.....	\$8,505,000

## RATES INCREASED

Because the cost of the power it buys from the Southern California Edison Company has been increased twenty-five per cent by a recent decision of the Railroad Commission, the Ontario Power Company, operating in Ontario, San Bernardino, county and vicinity, was today authorized by the Commission to increase its rate charged for optional irrigation pumping to a price which will produce sufficient revenue to offset the increased cost. Continuation of the present rates would mean the sale of power at a rate less than its

cost. The increase is temporary, as is the increase granted the Edison Company; the new rates are being collected for all regular meter readings taken on and after April 25th.

## NEW N. E. L. A. GEOGRAPHIC SECTION

Tentative plans for the organization of a Great Lakes geographic section of the N. E. L. A. were made at a conference in Chicago a short time ago. The conference was attended by the following:

For the Illinois State Electrical Association: B. J. Denman, president (president Tri-City Light and Power Company, Davenport, Iowa; E. V. Prather, secretary, Springfield, Illinois. For the Indiana Electric Light Association: Phil. H. Dwyer, president (assistant treasurer and manager, Indiana Railways and Light Company), Kokomo, Indiana; Thos. Donohue, secretary (local manager, Northern Indiana Gas and Electric Company), Lafayette, Indiana. For the Wisconsin Electric Association, N. E. L. A.: W. C. Lounsbury, president (general manager, Superior Water, Light and Power Company), Superior, Wisconsin; J. P. Pulliam, secretary for the Michigan section, Milwaukee, Wisconsin; W. N. Lewis, president (district manager, Consumers Power Company), Muskegon, Michigan; Herbert Silvester, secretary (Eastern Michigan Edison Company), Ann Arbor, Michigan; and Martin J. Insull, of the Middle West Utilities Company, Chicago, Illinois.

## COPY FOR N. E. L. A. BULLETIN

In order that the N. E. L. A. Bulletin may be kept both pointed and newsy, the following question and suggestion are being sent to company officials from the Bulletin office:

Has your company had recent changes in organization, ownership, control, or rates; staff promotions; plant expansion; meetings or organizing of employees' clubs; or other happenings of interest to the industry? If member executives will ask themselves: "Would I want to read this news if I were in another company in another part of the country," it is believed that they will submit the kind of copy we want for the Bulletin.

Some of the strongest N. E. L. A. company sections send in splendid material, but nevertheless it is felt that many central stations not represented by company sections could contribute more than they have been offering. This is particularly true of the small companies, whose strength and progress are essential to the welfare of the central station industry as a whole, and whose work is often unchronicled.

Further instructions are also given to the effect that news should be reported as quickly as possible. Forms close the 15th of the month preceding cover date, though it is often possible to find a place in the Bulletin for material received a few days later.

## EMORY WISHON'S EASTERN VISIT

In addition to putting over one of the most strenuous as well as successful speaking tours ever undertaken in the East in behalf of hydroelectric development of the West, Emory Wishon, assistant general manager of the San Joaquin Light and Power Corporation, and president of the Pacific Coast Section, N. E. L. A., has found time to look into affairs of the National Association and pass forceful and helpful comment as indicated in the following letter to R. H. Ballard, President of the National Electric Light Association:

"I spent the morning with Mr. Aylesworth going over a great number of matters with him, and discussing the Geographic Section idea with him from all angles. This is just to congratulate you on the man you selected. He is the kind of a man the association has been needing for a long time, and I am of the opinion that he will keep things moving for the good of the association from now on. Have another date with him on Tuesday. Hope everything is going well on the Coast.

Very truly

A. EMORY WISHON.

## CONTRACT LET FOR HETCH HETCHY TUNNELS

The contract for the fully lined tunnels on the Hetch Hetchy project has been awarded to the Construction Company of North America on the cost-plus basis. The contractor will be paid in Hetch Hetchy bonds at par and he guarantees that the cost of the entire work will not exceed \$7,802,953.80, which includes his fee of \$1,190,000. The city engineer will retain supervision of all the work. The approximate difference in the price of the accepted contract and the bid on the unit plan of the R. C. Storrie Company was



\$2,000,000. The cost-plus plan has been pronounced legal by the city attorney and the special counsel of the Hetch Hetchy project, and while there have been injunction suits threatened on the claim that the cost-plus contract is in opposition to the city charter the work will be started at once by the contractors. The immediate sale of \$8,000,000 of Hetch Hetchy water bonds was voted by the Supervisors at the same time to carry out the contract. While the contract is for three years' work necessary to complete the mountain division of the project, there is a provision that it can be terminated at the end of one year, either by the city or by the contractors.

#### COMPANY CHANGES NAME

The name of the Puget Sound Traction Light & Power Company has been changed to the Puget Sound Power and Light Company. Since the sale of the Seattle street railway lines operated by the old company, it has been concentrating on power and light business, hence the change of name. The reason, however, is fully set forth in the following statement by A. W. Leouard, president of the Company:

"The company does an electric light and power business in 142 communities in the Puget Sound Basin, the territory covered extending from the Canadian border at Sumas to Olympia. Increased power demand compels the company to concentrate its energies on power and light lines. This is due to the electrification of industry and to the larger use of electricity in the homes. On top of the growing demand for this form of energy in industry and the increased use of electrical appliances in the homes is coming the electrification of railroads. One of the very largest single power customers in the Northwest now is the Chicago, Milwaukee & St. Paul Railroad.

"The Puget Sound Power & Light Company has hydro-electric plants at Electron on the Puyallup river, at Snoqualmie Falls, on the North fork of the Nooksack in the Bellingham district.

"The combined plants have a capacity of 114,700 horsepower hydro-electric, in the Tacoma-Seattle-Everett district and besides there is a steam plant of 40,000 horsepower. Thus the total capacity in the Tacoma-Seattle-Everett district is approximately 154,000 horse power and the combined capacity of the two districts is about 167,000 horsepower. In addition the company owns several valuable but as yet undeveloped hydro-electric sites and has sufficient storage at Lake Tapps to further increase the capacity of the White River plant.

"It will be the purpose of the new Puget Sound Power & Light Company to give its undivided attention to the development of power and light to the encouragement of industry requiring cheap and economical hydro-electric energy.

"There will be a practically unlimited supply of such energy always available in this region. In supplying the demand of the Milwaukee for operation of the Coast division of its transcontinental lines the plants of the company have been interconnected with generating and transmission lines and a combined generating capacity of more than 300,000 horsepower.

"Construction of a 30-mile link between Everett and Mount Vernon will bring this interconnected system into connection with the Bellingham District and the systems of Southwest British Columbia, thus adding another 135,000 horsepower, or a total of 435,000 horsepower available over a very wide territory to carry the industrial load of the region.

"Possible increased development of other available power sites would double that capacity without going upon the public domain for any additional hydroelectric resources."

#### CHANGES IN THE NATIONAL ELECTRICAL CODE

At the recent public hearing with regard to recommended changes in the National Electrical Code, the limit of low potential systems was fixed at 600 volts instead of 750 volts as recommended in various sections of the Bulletin discussed at the meeting.

The proposal to require polarity identification in all wires installed on and after January 1st, 1921, was modified to require that beginning July 1st, 1921, twin wires for conduit work and twisted pair wires for armored cable in sizes Nos. 12 and 14 B and S Gauge provide the means for continuous identification proposed in the bulletin for rule 26a. Rule 77 on fixtures to be revised to require identification marking by the fixture manufacturers of the wire connected to the screw shells of socket.

A committee is to be appointed to consider requirements for the installation of concealed extensions from existing wiring in buildings of fire-resistive construction.

Reports of the following committees were considered and adopted substantially the same as printed in the Bulletin.

Committee on Cars and Railways; Devices and Materials; Outside Wiring, Building Supply and Services; Theatres, Motion Pictures, Places of Public Assembly and Garages; Reconciling the National Electrical Code and the National Electrical Safety Code.

In the report of the committee on Fixtures, Heaters, Signs and Lamps—under the section on Fixtures—Rule 30a was made to read:

Insulating joints may be omitted in the case of straight electric fixtures installed on grounded race ways when the grounded wire of the circuit is connected to the screw shell and when approved fixture wire is used.

The report of the committee on Generating and Substations was adopted as printed but in addition the committee was asked to consider amendments to Rule 1d to exclude from its application, equipments of public utilities.

The report of the Section on Overload Protection of Motors under the committee on Industrial Applications was referred back with power to the committee for conference with industries interested. The report on the subject of Size and Protection of Conductors of Motor Circuits was also referred to the committee with power and instructions to continue the last paragraph of present rule 8c. The recommendations under the head of Motor Switches were approved, but the report was referred back to the committee with power for rewording after consideration of the problem of large switches. Under the section, Motor Switches—Enclosed Type, the recommendation made to require the externally operated enclosed type of switch for motor circuits was not adopted.

Under the report of the committee on Signaling Systems, the supplementary report on radio equipment was adopted, but with changes in minor details as to equipment. The committee was requested to consider the use of resistance devices instead of spark gaps.

The report of the committee on Wiring Standards and systems, conduit work, sizes of wire, etc., was adopted as it stood except for the recommendations under the section on Wattage Limits for Branch Lighting Circuits where the recommendation not to require special permission for 1320 watts on circuits with medium base sockets was not adopted.

The recommendation to change 1320 watts to 1500 watts was not adopted, and where provision was made for circuits up to 4000 watts when Mogul sockets are used special permission will be required.

Under rule 34 circuits of 4000 watts will be permitted by special permission.

The wording of the 1918 Code is to be continued, except for the addition of the last sentence in proposed Rule 26j as printed in the Bulletin and except for the recognition of Varnished Cloth Insulation.

The recommendations as printed in the Bulletin under the heading, Low Voltage Lighting Systems were referred back to the committee with power for editing.

#### FARMERS ASKED TO CO-OPERATE

An effort to secure the cooperation of the farmers in the fight to overcome the power shortage is being made by all of the farm bureaus, farm advisors, growers associations, county horticultural commissioners and power companies of California. This effort is the result of a message sent out by power administrator H. G. Butler to the organizations in touch with the farmer with the request that every farmer who uses electricity be asked to cooperate with him in the effort to reduce the existing and threatened shortage. In his message, Mr. Butler said:

"May we have your help and cooperation in explaining the power situation to the farmers and asking them to assist themselves, and all other power users in the state, by doing their electric pumping nights and Sundays, and as far as they can, after the first of May. If we can reach the farmers who operate electric pumps and enable them to understand the situation we believe we can secure their help to such an extent that the threatening power shortage of this year will be materially less than it would otherwise be.

"We suggest that you bring these facts to the attention of the farmers:

"First. The power shortage has been caused by deficient rainfall in California and by large increases in the demand for power. It extends practically all over the State except in the small territory served by the San Diego Consolidated Gas & Electric Company.

"Second. The most important single thing that can be done to minimize this shortage is to make the total demand on the power companies as uniform as possible during the week and during the twenty-four hours of the day. A uniform load enables the power companies to operate their steam plants to full capacity all the time and this makes more power available.



"Third. During the irrigation season the agricultural pumping load makes by far the heaviest demand on the resources of the power companies, and consequently it is the load from which the greatest relief is secured when it is shifted from day to night and to Sundays, as these are the times when the use of power for other purposes is at a minimum.

"Fourth. It should be understood that the farmers are not singled out in the request to make this change in their hours of operation. Other industries, as far as possible, will be required to follow this practice.

"Fifth. The local representatives of the power companies will render such assistance as they can in helping the farmers make the change contemplated."

### TRADE NOTES

#### Change in Location —

The California Electrical Construction Company of San Francisco has moved to 681 Mission Street, where it has a ground floor location and better stock-room facilities.

#### Change in Department Office —

The manufacturing sales department of the Wellman-Seaver Morgan Company, which handles the company's sales of rubber equipment and machinery, has moved from the company's Akron office to its general offices at 7000 Central Avenue, Cleveland. The department is in charge of L. N. Ridenour.

#### Agents for China Appointed —

The Roller-Smith Company, New York City, manufacturers of electrical instruments, meters and circuit breakers, announces the appointment of the American Manufacturers Export & Import Corporation, Seattle, Washington, as its agent for the Republic of China. This company has branch offices in Shanghai, Hong Kong and Hankow. The Roller-Smith Company also announces the appointment of Mr. Hammond D. Baker as manager of its Detroit office. After receiving his discharge from the army, Mr. Baker went with the United Motors Corporation as technical traveling representative, later giving up this position to join the sales

department of the Hoskins Manufacturing Company of Detroit, from which concern he resigned to accept the position with the Roller-Smith Company.

#### Furnaces in France and Italy —

The Electric Furnace Construction Co., Philadelphia, reports the successful starting up of a "Greaves-Etchells" Electric Furnace of half-ton capacity at the works of Charles Bertolus in Bellegarde, France, and of a one-ton "Greaves-Etchells" Furnace at the works of Fonderie Ambrogio Necchi, Milan, Italy. On the latter furnace, the charges have been poured after two slaggings in just over two hours per charge, with an energy consumption of under 800 units per ton.

The successful starting of "Greaves-Etchells" Electric Furnaces at the works of the Dodge Steel Castings Co., Philadelphia, American Radiator Co., Buffalo, N. Y., and Hammond Steel Co., Syracuse N. Y., is also reported.

#### Removed from Chicago to New York —

The general offices of the Chicago Pneumatic Tool Company, have been transferred to the Chicago Pneumatic Building, a new 10-story structure erected for exclusive use of the Company on 44th St., New York.

Arrangements carefully made in advance, made possible the jump of this large organization across half of the continent without interference to the normal routine of business except for a brief period.

The Chicago, District Sales Branch previously in the Fisher Building has been moved at the same time to commodious new quarters on Chicago's new Boulevard Link, at 300 North Michigan Boulevard. The Chicago Service Branch formerly at 521 South Dearborn Street has been consolidated with the Sales Branch at the new address.

## WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

### A. I. E. E.—WESTERN SECTIONS

#### National Officers

President—Calvert Townley, Westinghouse Electric & Manufacturing Company.  
Secretary—F. L. Hutchinson, Engineering Society, Bldg., New York City.  
Meetings—Monthly.

#### Denver Section

Chairman—Prof. H. S. Evans, Univ. of Colorado, Boulder.  
Secretary—Robt. B. Bonney, Mountain States Tel. & Tel. Co., Denver, Colo.  
Meetings—Third Saturday of each month, at the Shirley Hotel.

#### Los Angeles Section

Chairman—Clem. A. Copeland, Bureau of Power and Light, Los Angeles.  
Secretary—R. W. Sorensen, California Institute of Technology, Pasadena, Cal.  
Meetings—Second Tuesday of each month.

#### Portland Section

Chairman—E. F. Whitney, General Electric Co., Electric Bldg., Portland, Ore.  
Secretary—W. C. Heston, Portland Ry. Light & Power Co., Portland, Ore.  
Meetings—Monthly.

#### San Francisco Section

Chairman—W. G. Vincent, 445 Sutter St., San Francisco.  
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.  
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

#### Seattle Section

Chairman—G. E. Quinan, Puget Sound Power & Light Co., 205 Electric Bldg.  
Secretary—Willis T. Batcheller, Seattle Light & Power System, Seattle, Wash.  
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

#### Spokane Section

Chairman—J. E. E. Royer, Washington Water Power Co., Spokane, Wash.  
Secretary—Foster Russell, Symons Bldg., Spokane, Wash.  
Meetings—Third Friday of each month.

#### Utah Section

Chairman—Markham Cheever, Utah Power & Light Co., Salt Lake City, Utah.  
Secretary—T. A. Purton, General Electric Co., Newhouse Bldg., Salt Lake City, Utah.  
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

#### Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.  
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

### A. I. E. E.—WESTERN BRANCHES

#### Idaho University Branch

Meetings—First Wednesday evening of each month from October to June.

#### Montana State College Branch

Chairman—Jesse Flynn, Bozeman, Mont.  
Secretary—J. A. Thaler, Bozeman, Mont.  
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

#### Oregon Agricultural College Branch

Chairman—F. A. Roehrig, Oregon Agr. College, Corvallis, Ore.  
Secretary—Roy Avrit, Oregon Agr. College, Corvallis, Ore.

#### Stanford University Branch

Chairman—R. Lewelling, Stanford University, Cal.  
Secretary—H. P. Wickersham, Stanford University, Cal.

#### State College of Washington Branch

Chairman—Glen Langdon, Pullman, Wash.

Secretary—Claude Kreisher, Pullman, Wash.  
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

#### California Institute of Technology Branch

Chairman—R. M. Otis, Throop Dormitory, Pasadena, Cal.  
Secretary—D. D. Smith, Cal. Inst. of Tech., Pasadena, Cal.

#### University of California Branch

Chairman—H. C. Silent, University of California, Berkeley, Cal.  
Secretary—M. L. Almquist, University of California, Berkeley, Cal.

#### University of Colorado Branch

Chairman—D. H. Rymer.  
Secretary—Lee J. Murray.  
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

#### University of Washington Branch

Chairman—G. R. Rice, Univ. of Washington, Seattle, Wash.  
Secretary—McKinley Donovan, Univ. of Washington, Seattle, Wash.  
Meetings—Monthly, first Tuesday, Forestry Bldg.

### CONTRACTOR-DEALER ASSOCIATIONS

#### National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.  
Secretary—W. H. Morton, 110 West 40th St., New York.  
Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland; J. F. NePage, Seattle.

#### British Columbia Ass'n Electrical Contractors and Dealers

President—E. Brettell, Vancouver, B. C.  
Secretary—R. G. Hargreaves, 422 Pacific Bldg., Vancouver, B. C.



**California Ass'n of Electrical Contractors and Dealers**  
 Chairman—Clyde L. Chamblin, 641 Mission St., San Francisco, Cal.  
 Secretary—J. W. Redpath, New Call Bldg., San Francisco, Cal.

#### California Sections

**East Bay Electrical Trades Association**  
 President—Hugh Kimball, 526—13th St., Oakland, Cal.  
 Secretary—J. M. Gregory, Woodmen of the World Bldg., 16th & Clay St., Oakland, Cal.

**Electrical Contractors and Dealers Ass'n of San Francisco**  
 President—T. J. Bennett, Rex Electric Co., San Francisco.

Secretary—Louis R. Ardouin, San Francisco.

#### Imperial Valley Section

President—Jerome Aiken.  
 Secretary—R. O. Graham, 123 Second St., Calexico, Cal.

#### Kern County Section

President—A. K. Carlsen.  
 Secretary—H. J. Anderson, Taft, Cal.

#### Long Beach Section

President, J. W. Lane.  
 Secretary—A. R. Dunn, 233 East Third St., Long Beach, Cal.

**Monterey Bay Electrical Contractors and Dealers**  
 President—W. Cox, Santa Cruz.

Secretary—D. K. Noggle, Monterey.

**Northern California Electrical Contractors and Dealers**  
 President—W. H. Gribble, Sacramento.

Secretary—H. Berg, Sacramento.

#### Orange County Section

President—W. B. Holland, Alhambra, Cal.  
 Secretary—H. J. Snow, Orange, Cal.

#### Orange Belt Section

President—E. J. Field.  
 Secretary—H. A. Snyder, 337 F Street, San Bernardino, Cal.

#### Sacramento Section

President—J. C. Hobrecht.  
 Secretary—Jas. Woods, 1110 J Street, Sacramento.

#### Santa Clara Section

President—Chas. Faser, 10 S. 10th St., San Jose.  
 Secretary—P. D. Cambiano, 161 S. 2nd St., San Jose.

#### San Diego Section

President—J. H. Leavitt.  
 Secretary—J. F. Zwienner, 995 So. St., San Diego.

#### San Joaquin Section

President—H. H. Courtright.  
 Secretary—Clyde Smith, 1230 J St., Fresno.

#### San Mateo Section

President—H. B. Weaver.  
 Secretary—M. E. Ryan, 205 Main St., Redwood City.

**Southern California Electrical Contractors and Dealers**  
 President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.

Secretary, Assistant—H. M. Mikesell, 623 Union Bldg., Los Angeles, Cal.

#### Denver Electrical Contractors' Association

President—E. C. Headrick.  
 Secretary—C. N. Shannon, 227 Coronado Bldg.  
 Correspondence Secretary—L. B. Roberts, 227 Coronado Bldg., Denver, Colo.  
 Meetings, 2nd and 4th Monday nights of each month.

**Electrical Contractors & Dealers of Salt Lake City**  
 President—G. W. Forsberg.

Secretary—E. H. Eardley, Eardley Bros., Salt Lake City.  
 Meetings—Saturdays, 1 p.m.

#### Montana Ass'n of Electrical Contractors and Dealers

President—J. C. Currah, Helena, Mont.  
 Secretary—M. Downing, Butte, Mont.

**Oregon State Ass'n of Electrical Contractors and Dealers**  
 President—R. C. Kenney, 388 Burnside Street, Portland.

Secretary—U. P. Mundt, Portland, Ore.

**Portland Local Ass'n of Electrical Contractors and Dealers**  
 President—Roy C. Kenney, Portland.

Secretary—H. C. Jones, 306 Concord Bldg., Portland.

Meetings—Alternate Mondays at Imperial Hotel Grill.

**Washington Ass'n of Electrical Contractors and Dealers**  
 President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.

Secretary—Forrest E. Smith, Seattle, Wash.

Meetings—Quarterly—second Thursdays of March, June, September and December.

#### JOBBER'S ASSOCIATIONS

**Electrical Supply Jobbers Association**  
 General Secretary—Franklin Overbath, 411 So. Clinton St., Chicago, Ill.

Meetings—Semi-annual.

#### Pacific Coast Electrical Supply Jobbers

President—T. E. Bibbins, 575 Mission St., San Francisco.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

#### Electrical Credit Ass'n of the Pacific Coast

President—R. J. Holtenman, Holabird Elec. Co., San Francisco.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—Annually; San Francisco; May.

#### OF ELECTRICAL INTEREST

##### California Electrical Cooperative Campaign

Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.

Secretary—Captain Howard Angus, New Call Bldg., San Francisco.

##### Colorado Electric Light, Power and Railway Association

President—E. A. Phinney, Jefferson Co. Power & Light Co.

Secretary-Treasurer—F. P. Safford, Denver Gas & Electric Co., Denver, Colo.

##### Electric Cooperative League of Los Angeles

President—Ralph B. Clapp, San Fernando Bldg., Los Angeles.

Secretary-Treasurer—Carl M. Heintz, Westinghouse Electric & Mfg. Co., Los Angeles.

##### Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.

Secretary—A. E. Coney, Great Western Power Company, San Francisco.

Meetings—About every 60 days.

##### Illuminating Engineering Society

President—S. E. Doane.

Secretary—Clarence L. Law.

Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Co., Portland, Ore.

W. R. Putnam, Utah Power & Light Co., Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.

Meetings—First Tuesday each month.

##### National Electric Light Association

President—R. H. Ballard, Southern California Edison Company.

Secretary—T. Comerford Martin, 29 West 39th St., New York.

##### New Mexico Electrical Association

President—E. A. Roberts, Public Utilities Co., Carlsbad, New Mexico.

Secretary—Chas. E. Twogood, Albuquerque Gas & Electric Company, Albuquerque, N. Mex.

##### Northwest Electric Light and Power Ass'n

President—John B. Fiske, Washington Water Power Company.

Secretary—L. A. Lewis, Spokane, Wash.

Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

##### Pacific Coast Section, N. E. L. A.

President—A. E. Wishon, San Joaquin Light & Power Corporation, Fresno, Cal.

Secretary—A. H. Halloran, Journal of Electricity, Rialto Bldg., San Francisco.

Meetings—Annually, in April.

##### Portland Section, N. E. L. A.

Chairman—F. H. Murphy, Portland Railway Light & Power Company.

Secretary—Geo. Bowen, Portland, Ore.

##### San Francisco Electrical Development League

President—E. O. Shreve, General Electric Co., San Francisco.

Secretary—R. D. Compton, Pacific Gas & Electric Co., San Francisco, Cal.

Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel, San Francisco.

##### Southwestern Electrical and Gas Association

President—W. A. Sullivan, Shreveport, La.

Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

##### Synchronous Club

Secretary—H. N. Beecher, City Hall, Los Angeles.

##### Telephone and Telegraph Society of the Pacific Coast—San Francisco Section

President—W. H. Brommage, Pacific Tel. & Tel. Co., San Francisco.

Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

#### MECHANICAL ENGINEERS

##### National Officers

President—Col. Fred J. Miller, 2905 Singer Bldg., New York.

Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

##### Los Angeles Section, A. S. M. E.

President—Charles Burnham, Los Angeles.

Secretary—R. W. Lacy, 600 Washington Bldg., Los Angeles.

Meetings—Quarterly.

##### Oregon Section, A. S. M. E.

President—B. C. Hall, Willamette Iron & Steel Works.

Secretary—E. W. Lazell, Chem. & Efficiency Engr., 537 Railway Exchange Bldg., Portland.

**San Francisco Section, A. S. M. E.**  
 President—W. F. Durand, Stanford University, Palo Alto, Cal.

Secretary—Jas. A. Kinkead, Rialto Bldg., San Francisco.

Meetings—First Tuesday of each month.

Meetings—Quarterly.

Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

**Washington Section A. S. M. E.**  
 President—E. O. Eastwood, Univ. of Wash.

#### AMERICAN ASSOCIATION OF ENGINEERS

##### National Officers

President—W. H. Finley, President Chicago & Northwestern Railroad.

Secretary—Frederic Bass, 29 S. La Salle St., Chicago.

**Los Angeles Chapter, American Ass'n of Engineers**  
 President—E. G. Shibley.

Secretary—A. L. Harris, Central Bldg., Los Angeles.

**Oregon Chapter, American Ass'n of Engineers**  
 President—W. H. Marsh.

Secretary—R. W. Barnes.

**Pacific Northwest Society of the American Ass'n of Engineers**  
 President—S. D. Clinton, Vulcan Iron Works.

Secretary—J. A. Hopkins, Seattle Boiler Works.

**San Francisco Chapter, American Ass'n of Engineers**  
 President—William S. Wollner.

Secretary—A. G. Mott.

#### ENGINEERS' CLUBS

##### Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of Commerce, Oakland, Cal.

##### Engineers' Club of Sacramento

President—George S. Nickerson, 914 Forum Bldg., Sacramento.

Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento, Cal.

**Engineers' Club of San Francisco**  
 President—Ely C. Hutchinson, Pelton Water Wheel Company, San Francisco.

Secretary—Allen G. Jones, Rialto Bldg., San Francisco.

Annual Meeting—October.

##### The Engineers' Club of Seattle

President—H. E. Horrocks, Seattle, Wash.

Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.

Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

#### JOINT ORGANIZATIONS

##### Colorado Engineering Council

President—Arthur Ridgway, 810 Equitable Bldg., Denver.

Secretary-Treasurer—Robert J. Grant, 614 Interstate Trust Bldg., Denver.

##### Joint Committee Technical Societies of Los Angeles

Chairman—George A. Damon, San Fernando Bldg., Los Angeles.

Secretary—W. K. Barnard, 705-6 Central Bldg., Los Angeles.

##### Joint Council of the Societies of San Francisco

Chairman—C. D. Marx, Stanford University.

Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

##### Spokane Engineering and Technical Ass'n

President—L. K. Armstrong, A. S. M. E.

Secretary—A. D. Butler, City Engineer, Spokane, Wash.

Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

#### MISCELLANEOUS

##### American Ass'n for the Advancement of Science—Pacific Division

President—John Campbell Merriam, University of California; Acting Chairman National Council of Research.

Secretary (acting)—J. R. Douglas, 439 Library, University of California, Berkeley, Cal.

Meetings—Annual.

##### Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg., San Francisco.

Secretary—Aubrey Drury, Monadnock Bldg., San Francisco.

Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

##### Idaho Society of Engineers

President—W. H. Gibson, Mountain Home, Idaho.

Secretary—Ira F. Shaffner, Boise, Idaho.

##### Pacific Coast Gas Association

President—A. B. Day, Los Angeles Gas & Electric Co.

Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

##### Society for Promotion of Engineering Education

Secretary—H. J. Bishop, University of Pittsburgh, Pittsburgh, Pa.

##### Utah Society of Engineers

President—Leonard Cahoon

Secretary—Wm. H. Kelsey.

Meetings—3rd Wednesdays except May, June, July and August.

Meetings—Quarterly.



## LATEST IN EVERYTHING ELECTRICAL

### NEW ELECTRIC RANGES

The two latest models of electric ranges which are being manufactured by the Simplex Heating Company of Cambridge have many features which will make them popular with the housewife.



The new Simplex range number twenty-nine above shows a most compact and convenient arrangement of oven, warming ovens, and electric plates. Range number twenty-five is especially well adapted to the small kitchenette.

The enclosed unit obtains the intense red heat which is so conducive to quick and satisfactory results in baking. It will be seen from the illustrations that the vertical switch panels for operating the ranges are arranged so as to add to their general appearance. Being made of white enamel they are a very clean and clearly marked surface so that the indicating pointers on the switches are very easily read.

### HIGH VOLTAGE CURRENT TRANSFORMER

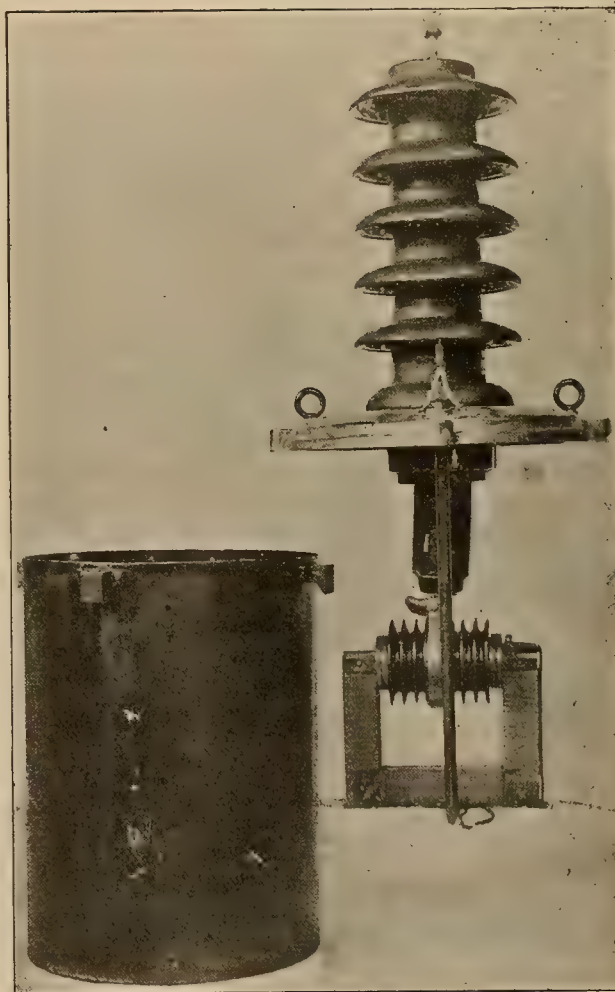
A certain inexpensive, accurate, high voltage current transformer has been manufactured and is being used by one of the largest power companies in the United States.

It is designed for 60-kv. and 100-kv. lines both for indoor and outdoor service, with single and double ratios. By the loosening of four cap screws the transformer can be raised out of its case, all parts being very accessible. The primary winding is wound in the center of the corrugated insulating bushing, suspended from the terminal rods, which are cemented to the outlet insulating bushing.

A cast clamp shackle supports the weight, and the single ratio transformer is used as one turn of the primary winding.

On the double ratio transformers all leads from the winding are brought through the shackle and are connected at top of the shackle by cap screws. The case and cover are made of tank steel electrically welded, the outlet bushing being cemented in the cover. The secondary is wound in two coils, one sliding in each end of the bushing, and are connected in series, the leads passing around the core to the bottom and brought through the cover by metal conduit. The core is built up of a high grade of silicon steel (selected from samples and tests made of various steels), giving the least loss per pound. It is piled with staggered butted joints and clamped at the corners by brass machine screws.

The ratio of this transformer is tested by a special standard transformer, and a differential wattmeter, the disc of the wattmeter remaining quiet at all loads. The sensitivity of this differential wattmeter is tested by connecting



The above shows how this high voltage current transformer can be taken out of its case so that all parts are easily accessible. This can be done by the loosening of four cap screws which can be seen on the case in the picture.

the two current coils in series, short circuiting the terminals with a small wire, connecting the center tap of current circuit to the center of the shorting wire, applying potential to potential coil, and the disc will remain quiet. Placing the hand on the shorting wire either side of the center increases the resistance of the wire by the heat of the hand, and the disc starts to rotate. One can plainly see the accuracy of



ratio between standard and the one on test when the disc of the wattmeter remains perfectly still at all loads.

Any difference in ratio is corrected by driving up the lamination, or tightening the clamping screws; at other times a turn of secondary must be added or subtracted, as the case may be.

This transformer is being used for metering power sold direct to the consumer, for relays and solenoid trips.

The 60-kv. transformers are given 100-kv. high potential test, and the 100-kv. transformers 150-kv. test before leaving the factory.

### SAFETY CUTOUT FOR ELECTRICAL HEATING DEVICES

There is a recognized fire hazard from the overheating of electrical devices, such as pressing irons, when the operating current is left on indefinitely. An ordinary fuse which melts only in the case of overload fails to prevent such overheating due to the normal current. A device has been invented by Wilhelm Gattiker and Wilhelm Baumann, Nordstrasse 273, Zurich, Switzerland, which consists of a fuse which melts when the device reaches an unsafe temperature. It consists of a wire or strip of a metal alloy similar to fuse metal which is included in the electrical circuit and which is designed to melt as soon as an unsafe temperature is reached, thus opening the circuit and cutting off the supply of energy.

The cutout is constructed in different forms according to the devices with which it is to be used. It may form a part of the device itself; it may form a connection between the device and the leading-in wires, or it may be connected in the lead wires themselves. The cutout may be placed on any convenient part of the heating device, as for example, a plug in the wall of the device.

### BOOKS AND BULLETINS

#### Electric Railway Directory

Published semi-annually in February and August by the Directory Department of the Electric Railway Journal of the McGraw-Hill Company, Inc., Tenth Avenue at 36th Street, New York. Subscription price, \$7.50 per year. Single copy, \$4.00.

The February edition of this directory of the electric railway companies in the United States, Canada and Mexico, contains information which has been corrected up to December, 1919. It contains a list of the electric railways of these three countries of North America, arranged by states and cities, a list of railway associations, of national and state railroad and public utility commissions, and a numerical index to electric railway companies as well as an alphabetical list of electric railway officials and operating men and statistics of the electric railway industry.

In bringing the directory down to date a great many changes have been made. For example, there are 1450 changes in personnel, 650 changes in power plant and substation equipment, 500 in mileage and rolling stock, 44 receiver notes, and fifteen reorganizations.

#### The Organization of Industrial Scientific Research

By C. E. Kenneth Mees; 175 pp. 5½ x 8 in. Published by McGraw-Hill Book Company and for sale by Technical Book Shop, Rialto Building, San Francisco. Price \$2.00.

As most of recent industrial progress has been based upon the results first tried out in the research laboratory it behooves the laboratory worker and the heads of manufacturing concerns to understand how to organize their forces most effectively. The author of this text has drawn from the wealth of his experience as director of the research laboratory of the Eastman Kodak Co. and also from the experience of such concerns as the U. S. Steel Corporation, the American Telephone & Telegraph Company and the General Electric Company to indicate to others how research work may be successfully organized. He answers questions as to the cost

of starting and maintaining research workers, where new men may be obtained, what may be expected in the way of results and how to organize a research department. He treats of various types of laboratories, the selection of a staff and equipment and design for specific industries. For any one concerned with such problems the book will prove invaluable.

#### Elements of Steam and Gas Power Engineering

By Andrew A. Potter and James P. Calderwood; 304 pp. 5½ x 8 in., 225 illustrations. Published by McGraw-Hill Book Company, New York City, and for sale by Technical Book Shop, Rialto Building, San Francisco. Price \$2.50.

'Tis most refreshing for the practical man, not familiar with the application of mathematics to thermodynamics, to find a simple, straightforward, usable account of the various types of machinery found in steam and gas power plants. The authors of this book, which possesses this pleasing character, have applied their experience in teaching engineering students and have produced a text which should be fully as valuable to men responsible for the practices of steam or internal combustion engine plants as to students and salesmen desiring to familiarize themselves with power plant equipment. Mathematics, beyond simple arithmetic, is tabooed throughout the text. Pictures of modern equipment are abundant. The first 190 pages are devoted to steam power generation and utilization, including fuels, combustion theory of steam generation boilers, auxiliaries, accessories, steam engines, turbines and the testing of steam power equipment. The next 70 pages take up the study of the internal combustion engine, fuels, various auxiliaries and testing methods. The last two chapters are concerned with the application of steam and gas power to locomotives, automobiles, trucks and tractors. In each case the treatment covers fundamental principles, structural details, operation and management. The entire text is admirably adapted to the needs of the man who wants to get a good general idea of power apparatus.

### Engineering

#### Circulars to Aid Sales

The Cutler-Hammer Manufacturing Company of Milwaukee has prepared, in connection with other forms of dealer helps, some ten or twelve folders for use by dealers, jobbers and central stations. These folders have been furnished upon specific request and have not only increased the sale of 70-50 switches but also heating appliances on which they are used.

The Harvey Hubbell, Inc., of Bridgeport, Conn., offers to send a supply of its new Circular No. 192 to dealers upon request. This circular describes and illustrates the superior Hubbell reflectors and is imprinted with the dealer's name.

The new water supply system of Victoria, British Columbia, is excellently described in a booklet published by Sanderson & Porter, Engineers.

What Is a Shop? is the question answered by the Westinghouse, Church, Kerr & Company, Engineers and Constructors, in a recently published pamphlet which pictures the many shops which this company has designed and built.

### DEVELOPING NATIONAL WATER POWER

[Continued from page 478]

**Indiana (#17 F).** Water power in Indiana can in no case compete with steam power. The only situation under which water power can be used in Indiana is as an auxiliary to a steam power plant but never with a steam plant as an auxiliary to a hydro power plant.

**Iowa (#25 F).** Yes.

**Kansas (#51 F).** The chief value of water power in this state will be to supplement steam plants during the period when there is sufficient flow in the streams to warrant the use of water power. With the present high prices of coal and oil more attention is being given by power companies to this phase of water power development.

**Kentucky (#23 F).** Yes.

**Maine.** See answer under Connecticut for New England states.

**Maryland (#22 F).** Probably, this depends on the relation which is at present fluctuating between the increased cost of development on one hand and the increased cost of coal on the other since pre-war costs.

**Massachusetts.** See answer under Connecticut for the New England states.



**Minnesota (#19 F).** The water powers of this state are subject to great reduction in the winters, due to freezing and to some extent to droughts in the summer. On the other hand, if operated in connection with adequate steam plants they do show a decided tendency to reduce the average cost per kw.-hr. of current generated and at the present price of coal most certainly can compete with power produced entirely by coal.

**Nebraska (#15 F).** I do not feel that the development of undeveloped water powers offers any economies over the continued production of power by steam. Such water power, if developed under favorable conditions, could successfully compete with power production by coal.

**New Hampshire.** See answer under Connecticut for the New England states.

**New York (#24 F).** The figures represent the quantities of undeveloped power which might be developed economically under present condition of coal costs, steam generating efficiencies and industrial market within transmitting distance of the power sites in the state. The theoretical potential power of the streams exceeds this by an amount which is considerable, but not exactly known, although it is probable that posterity will be forced to make use of it when the coal supply is sufficiently diminished.

**(#27 F).** Water powers are much more economical than steam power at the present price of coal unless the load served is of very short duration, and in these days of interconnecting systems, we hardly have such a thing as a short hour load.

**(#45 F).** Water power can successfully compete with power produced continuously by coal excepting in the vicinity of New York City. It can be transmitted electrically with advantage to most of the large towns and industrial centers to carry continuous loads, leaving steam plants to be used only for peak loads and emergency purposes.

**Pennsylvania (#39 F).** In general, the development of water powers in this state will not offer any material economies over the production of power by steam. Properly developed in an economical manner there are many chances where such water powers could be used for relatively short hours daily to take the peak loads from steam stations, thereby minimizing the costs of steam plants and improving the load factor of such steam plants with a consequent improvement in fuel economy. Plants of this nature, however, would be developed without any extremely large supporting impoundage, so that in the main they could be rebuilt reasonably cheap. At the present time water powers cannot be developed to compete with coal for the delivery of power.

**Vermont.** See answer under Connecticut for the New England states.

**Wisconsin (#43 F).** This question cannot be answered yes or no, as there are a great many factors that enter into the economical development of water power. A water power may not be economical to develop for one business while in the case of another business it might be very profitable. We therefore cannot answer this question, as we should advise each individual possibility be investigated separately.

#### APPENDIX "B"

Following is a list of publications giving a large part of the present available data and discussion on the subject of water power development.

This list is by no means a complete bibliography of the subject, but it is believed to include most of the authentic publications of data on water power development and its closely correlated subjects (economic, legal, financial and engineering), as well as a number of important recent papers, reports and discussions on the subject.

#### FEDERAL GOVERNMENT PUBLICATIONS

"Conservation of Water Resources." U. S. Geological Survey Water Supply Paper #234. Reprint from Report of the National Conservation Commission, February, 1909.

#### OTHER WATER SUPPLY PAPERS OF THE U. S. GEOLOGICAL SURVEY

"Report of the Commissioner of Corporations on Water Power Development in the United States." March 14, 1912.

"Electric Power Development in the United States." Report of Secretary of Agriculture to the Senate, 1916. Senate Document No. 316 ("Merrill Report").

"Hearings Before the Committee on the Public Lands of the House of Representatives on the Water Power Bill, H. R. 14893." April 30th to May 8th, 1914.

"Hearings Before the Committee on Water Power of the House of Representatives." March 18th to May 15th, 1918.

"Conservation Through Engineering." By Franklin K. Lane, U. S. Geological Survey Bulletin No. 705. (Extract from Annual Report of the Secretary of the Interior, 1919.)

#### STATE GOVERNMENT PUBLICATIONS

Water Codes of Various Western States. Report of Various State Engineers, and State Water Supply and Drainage Commissioners.

#### OTHER MISCELLANEOUS PUBLICATIONS

"Elements of Western Water Law." (1918.) By A. E. Chandler, Technical Publishing Co., San Francisco.

"Law of Irrigation and Water Rights." By Clesson S. Kinney of the Salt Lake City Bar. (1912.) Bender Moss Co., San Francisco.

"Hydroelectric Energy as a Conservator of Oil." Journal of Electricity, Vol. 39, Page 299.

"Water Rights in the Western States." By Samuel C. Wiel of the San Francisco Bar. (1911.) Bancroft Whitney Co., San Francisco.

"Water Power in the Southwestern States." By E. C. Murphy, Journal of Electricity, Vol. 39, Page 549.

"State and National Water Laws with Detailed Statement of the Oregon System of Water Titles." By John H. Lewis, Ex-State Engineer of Oregon. Reprint from Transactions of American Society of Civil Engineers, Vol. 76, Page 637 (1913).

"War Service of Electrical Energy." By Robert Sibley, Journal of Electricity, Vol. 40, Page 112.

"Facts About Water Power." Pamphlet prepared by the Executive Committee of the Water Power Development Association, Munsey Building, Washington, D. C.

"Power Resources in Southern California." By H. A. Barre, Journal of Electricity, Vol. 40, Page 330.

"Water Powers of British Columbia." By Arthur V. White, Consulting Engineer, Commission of Conservation, Canada (Ottawa, 1919).

"Joint Operation of Power Companies." By J. P. Jollyman, Journal of Electricity, Vol. 40, Page 402.

"Report on Columbia River Power Project." By L. F. Harza. (1914.) Technical Publishing Co., San Francisco.

"America's Energy Supply." By Chas. P. Steinmetz, A. I. E. E. Proceedings, Vol. 37, Part 2, Page 985 (June, 1918).

"Seventeen Water Development World Records." Journal of Electricity, Vol. 41, Page 6.

"Electrochemical Industries and Their Interest in the Development of Water Powers." By Lawrence Addicks, A. I. E. E. Proceedings, May, 1916.

"Three Major Power Possibilities in California." By F. H. Fowler, Journal of Electricity, Vol. 41, Page 12.

"Water Power Development and the Food Problem." By Allerton S. Cushman, A. I. E. E. Proceedings, May, 1916.

"Undeveloped Water Power in the Southwest." By F. H. Fowler, Journal of Electricity, Vol. 41, Page 246.

"Water Power and Defense." By W. R. Whitney, A. I. E. E. Proceedings, May, 1916.

"The West During the Last Thirty-one Years—Achievements and Possibilities." Journal of Electricity, Vol. 41, Page 342.

"Relation of Water Power to Transportation." By Lewis B. Stilwell, A. I. E. E. Proceedings, May, 1916.

"Statistical Data on Power Companies." By W. F. Neiman, Journal of Electricity, Vol. 41, Page 350.

"The Water Power Situation, Including Its Financial Aspect." By Gano Dunn, A. I. E. E. Proceedings, May, 1916.

"Power Possibilities in California." By F. H. Fowler, Journal of Electricity, Vol. 41, Page 393.

"Economic Supply of Electric Power." By W. S. Murray, Consulting Engineer, New York, and other prominent eastern engineers. Journal of the American Institute of Electrical Engineers, March, 1920; Page 219.

"Water Power Situation on the Pacific Coast." By Major George F. Sever, Journal of Electricity, Vol. 42, Page 6.

"Role of Water Power and Coal in Super Power Systems." By Philip Torchio, Chief Electrical Engineer, New York Edison Co., Journal of A. I. E. E., March, 1920; Page 315.

"Source of Power for California Railway Electrification." By F. H. Fowler and Robert Sibley, Journal of Electricity, Vol. 43, Page 371.

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A. B. WEST

A. G. WISHON

WATER POWER DEVELOPMENT COMMITTEE,

NATIONAL ELECTRIC LIGHT ASSOCIATION.



## NEW ELECTRICAL DEVELOPMENT

Reports of appropriations for pipe line and steam plant construction come from the Northwest while development plans requiring an expenditure of \$123,000 are recorded among Pacific Central items. The Southwest reports electrical installation for pumping municipal water supply, while news of power company construction and rate increase comes from the Intermountain district.—The Editor.)

### THE PACIFIC NORTHWEST

**SEATTLE, WASH.**—Chief Engineer Pierce of the Seattle Municipal Street Railway announces that construction of Madison loop and Madison Park will be started without delay.

**SEATTLE, WASH.**—Vulcan Manufacturing Company of Seattle was awarded the contract for furnishing steel roof trusses for the third unit of the auxiliary steam power plant, at \$7,979.

**EVERETT, WASH.**—Extensions and betterments to the existing light and power plant system, calling for an expenditure of about \$50,000, will be put into effect in the near future if the mayor approves an ordinance passed by the city council.

**ENTERPRISE, ORE.**—Enterprise Mercantile & Milling Company of this place has filed in the office of Percy A. Cupper, State Engineer, an application to divert 90 second feet of water from the Wallowa river and tributaries for generating 163.6 theoretical horsepower to be used for manufacturing electric light and power. A turbine will be installed.

**EVERETT, WASH.**—The Weyerhaeuser Timber Company has begun electrifying its mill "A" on the water front. A 750-kw. Allis-Chalmers steam turbine unit of the mixed pressure type will be installed. This will run normally on low pressure steam discharged from the Corliss engines in the mill and will provide electric power for operation of the planing mill and other machinery.

**CENTRALIA, WASH.**—The Carlisle-Pennell Lumber Company has suspended operations for 30 days at its big mill in Onalaska to permit the installation of a 2500-horsepower steam turbine. The plant will be electrically operated when operations are resumed. C. H. Rattray, construction engineer for the General Electric Company, is superintending the installation of the machinery.

**SALEM, ORE.**—Pending a decision of the state irrigation commission as to whether it will recommend a state guarantee of interest on a bond issue of \$750,000 by the Suttles Lake irrigation district in Jefferson county, the state engineering department has sent R. D. Cooper to make an appraisal of the lands in the district. The district embraces about 13,000 acres of irrigable land.

**KLAMATH FALLS, ORE.**—W. B. Parker, local manager of the Klamath Development Company, backed by San Francisco and Spokane capitalists, has purchased the Keno Power Company. The sale includes the plant on the Klamath river near Keno, now capable of manufacturing 850 horsepower; its transmission lines, franchises and all other property. The price was \$80,000. Kern Brothers, formerly of Chico, Cal., owned the Keno company.

**OLYMPIA, WASH.**—The State Capitol Commission awarded contracts for construction and equipment of the power and heating plant of the new capitol group. For the general construction, including the walls, tunnels and 175-foot stack with stone facing, a contract was awarded to Western Construction Company, Seaboard Building, Seattle, at \$132,330. The contract for mechanical equipment was awarded to Bergh-Griggs Company of Tacoma at \$124,879.

**SEATTLE, WASH.**—An ordinance appropriating four hundred and ninety-five thousand dollars for the completion of pipe line construction,

and for the construction of a 15,000-kw. generating unit at Cedar Falls, has been passed by the city council. An ordinance appropriating five hundred and eleven thousand dollars for the completion of a new 15,000-kw. unit at the Lake Union steam plant has been referred to the utilities committee for that body's report. The funds for both of these appropriations come out of the bond issues already provided by the council.

**WALLA WALLA, WASH.**—In order to handle the distributing business for farm lighting systems and other electrical appliances in eastern Washington, Idaho and part of Oregon, the Electric Equipment Company will increase its capital stock from \$25,000 to \$75,000. This action was decided upon at a meeting of the stockholders of the corporation. The Electrical Equipment Company, which opened a store in this city several months ago, with houses in Colfax, Washington, and Lewiston, Idaho, is having such rapid growth that it was compelled to treble its capital stock in order to keep up with this growth.

**HOOD RIVER, ORE.**—George R. Wilbur, secretary and attorney of the East Fork irrigation district, is back from Salem, where he was informed by the state water board that a decree, just entered in the adjudication of all water rights in the Hood River watershed, granted contentions of irrigation districts and made sweeping decisions against claims of power concerns. The case, which has been in litigation since 1914, involves practically the entire \$10,000,000 assessed valuation of the Hood River Valley, and from the property standpoint sets a record for such litigation in Oregon. The Powder river case, notable in Oregon irrigation litigation, involved a greater acreage.

**SEATTLE, WASH.**—Officials of the Marconi Wireless Telegraph Company of this city have received advice that the circuit court of appeals affirms in all respects the decision of Judge Jeremiah Meterer, denying that company the right to collect approximately \$3,000,000 as damages for alleged patent infringements from the Kilbourne & Clark Manufacturing Company, of Seattle. This decision is the culmination of an extended legal battle during which the Marconi interests alleged infringement by the Seattle concerns on the so-called Marconi tuning patent. Damages of approximately \$3,000,000 and an injunction preventing the local firm from manufacturing wireless telegraph equipment were sought by the Marconi company.

**SALEM, ORE.**—Settlement of a long-standing dispute between a company composed of Wallowa county citizens and the Enterprise Electric Company, with regard to water power rights on the Wallowa river, is in progress and probably will be effected within the next few weeks, according to Percy Cupper, state engineer, who returned here recently from eastern Oregon. The company of citizens, according to Mr. Cupper, filed for power rights on the west fork of the Wallowa river, while the Enterprise Electric Company made application for similar concessions on both the east and west forks of the stream. To bring about a settlement of the controversy and thereby prevent any unnecessary delay in development work, it is proposed to grant the application of the electric company for power rights on the east fork of Wallowa river, and hold in abeyance the filings of both

applicants for rights on the west fork of the stream until the persons interested can hold a conference and enter into some agreement.

### THE PACIFIC CENTRAL DISTRICT

**SANTA ROSA, CAL.**—Plans for a one-story building for the Pacific Gas & Electric Company in Santa Rosa, to cost \$10,000, are being prepared by Architect J. W. Dolliver, 114 Sansome street, San Francisco.

**SACRAMENTO, CAL.**—The City Commission has started a movement to have the city own and operate its own electric plant, gas plant and street railway system. The commissioners took the plan under actual consideration upon the advice of City Attorney Archibald Yell. An ordinance will probably be introduced at the next regular meeting of the Commission.

**SAN FRANCISCO, CAL.**—Water problems of the Sacramento and San Joaquin delta lands were discussed at a meeting of the Emergency Water Conservation Conference and the River Lands Association, held in San Francisco May 11. According to the association, the infusion of salt water into these two rivers, as the result of fresh water shortage, is a problem that requires immediate solution.

**SAN FRANCISCO, CAL.**—The regular quarterly dividend of 1½ per cent on the preferred capital stock of the Atlas Power Company was declared, payable May 1, 1920, to stockholders of record at the close of business on Tuesday, April 20, 1920. The stock transfer books of the company were closed against the transfer of stock at the close of business on April 20 and reopened at 9 o'clock a.m. on Saturday, May 1.

**LIVERMORE, CAL.**—An irrigation project comprising a large area of the Murray Township adjacent to Livermore is being fostered by the Chamber of Commerce. The petitions now in circulation, calling for the district formation and issuance of bonds for the necessary development, will be presented to the Supervisors, following which engineering investigations will be made into the feasibility of the source of supply.

**RICHMOND, CAL.**—Transfer of three lots at the corner of Twenty-third street and Macdonald avenue from the Landsberger estate to the Pacific Telephone & Telegraph Company is thought to indicate that the company intends erecting a new building for its station upon the site. The location is considered one of the most advantageous in the city for such a purpose. At the present time the telephone company occupies rented quarters on Third street.

**MADERA, CAL.**—Thomas H. Means of San Francisco has been appointed chief engineer of the Madera irrigation district. The preliminary engineering work will be started shortly and when this is completed a bond issue will be voted to secure money to build the project. The district contemplates building one of the largest dams in the world on the San Joaquin river, which will impound over 400,000 acre feet of the water of that stream.

**SUSANVILLE, CAL.**—Announcement is made here that the Red River Lumber Company is negotiating for the properties here of the Lassen Electric Company and will probably assume ownership as soon as certain legal adjustments are made. The Red River company is now engaged in installing its own power house on Feather



river and will be in position to supply nearby points with electrical energy. The plans include the construction of a power line between Westwood and Susanville.

**SAN FRANCISCO, CAL.**—Earnings of the Great Western Power system, consisting of the Great Western Power Company of California and the California Electric Generating Company, for February and the 12 months ended February 29, 1920, compare with 1919 as follows:

	1920	1919
February gross .....	\$ 457,327	\$ 409,273
Net after taxes .....	259,281	244,769
Surplus, after int. and taxes	102,961	115,720
12 months' gross .....	5,496,548	4,831,661
Net after taxes .....	3,093,522	2,872,699
Surplus, after int. and taxes	1,370,887	1,321,224

**OAKLAND, CAL.**—The Eel river, flowing into Humboldt bay, is considered the logical source from which to secure a water supply for the east bay region, according to the recommendation of Engineer P. E. Harroun of the East Bay Water Commission, whose report has been made public. Harroun's report points out that of three sources studied, the Eel river, the McCloud river and the Hetch Hetchy, the first named offers advantages held by none of the others and that sufficient water to supply east bay needs for the next seventy-five years can be brought to the district at a total cost of \$46,000,000. The engineer's report carries figures which show that the installation of the Eel river system compared to the McCloud or Hetch Hetchy projects means a saving to taxpayers of between \$40,000,000 and \$50,000,000, with virtually the same amount of water developed.

### THE PACIFIC SOUTHWEST

**SAN DIEGO, CAL.**—The San Diego Electric Railway is planning to do a large amount of repair work soon, as announced by the manager of Operation, W. H. Judy.

**SAN DIEGO, CAL.**—The City Council has adopted an ordinance, authorizing the treasurer to sell \$100,000 worth of Barrett dam bonds for \$97,500, to Isaac Irwin of the Citizens Saving bank.

**LOS ANGELES, CAL.**—An ordinance has been adopted granting the City Railway Company a franchise to construct a double track electric railroad along Temple Street from Spring to Hoover, Los Angeles, etc.

**LOS ANGELES, CAL.**—Communication has been filed with the City Council by the City Railway Company giving notice of intention of laying double track along Western Ave., from Melrose Ave. to Santa Monica Boulevard.

**DOUGLAS, ARIZ.**—Inspection has been made of various locations east of Douglas for a site upon which to construct a water reservoir to cost about \$44,000. The pipe line is to be installed from the reservoir to the City limits.

**QUINCY, CAL.**—Thirty-five thousand dollars is to be spent by the California Fruit Growers' Exchange in the construction of a water system at Davies Mill, this year. This is according to A. M. Mortensen, manager of the lumber department of the exchange.

**CASA GRANDE, ARIZ.**—Delegates of the Chamber of Commerce of this city visited Phoenix recently primarily for the purpose of a conference with representatives of the Pacific Gas and Electric Company with a view to developing the power of the Casa Grande Valley.

**EL CENTRO, CAL.**—Sealed bids will be received up to May 20, 1920 for the sale of \$500,000 bonds of Imperial Irrigation District at its office in the Masonic Building in this city. These bonds are a portion of the third issue of \$2,500,000. They are of par value of \$1,000 each bearing interest at 5½% per annum, payable semi-annually.

**WHITTIER, CAL.**—Arrangements are being made to serve this city with 870 horsepower in motors for pumping the water supply of the city. The electrical installation will displace

all of the present steam equipment. When complete the city will have one of the most up-to-date and most economical municipal water systems in the State of California.

**HOLBROOK, ARIZ.**—It is reported that the Santa Fe Railway Company intends to build a large electric power plant at Gallup and another at Trinidad, Colo., for the purpose of generating electricity for the electrification of the Santa Fe from Colorado to the Coast. These plants are to be followed by others. It is also said that these plants would be able to furnish light and power to towns along the line.

**PERRIS, CAL.**—Engineer Woodworth of the Colcan Land and Water Co., reports the engineers have been making a survey of the water situation since February and have covered about 40 miles of territory toward Perris from the dam site and are working now from a point near Winchester towards Perris and Temecula. It is thought all the field work will soon be finished and cost per acre of the system, etc., will soon be ready.

**GLOBE, ARIZ.**—Among the many improvements being made by the Globe Light and Power Company, is the remodeling of the electric plant, the installation of a 300 hp. Stirling boiler, and a thorough overhauling of the engines. This is about complete and will give increased power and minimize the chance of interruption in the service. All electric transmission lines will be brought up to conform with the standard of overhead construction of the N. E. L. A.

**MADERA, CAL.**—Thomas H. Means of San Francisco has been appointed chief engineer of the Madera irrigation district. The preliminary engineering work will be started shortly and when this is completed a bond issue will be voted to secure money to build the project. The district contemplates building one of the largest dams in the world on the San Joaquin river, which will impound over 400,000 acre feet of the water of that stream.

### THE INTER-MOUNTAIN DISTRICT

**SANTAQUIN, UTAH.**—The city of Santaquin is considering the installation of a street lighting system on the main street, the same to be series incandescent, and to consist of about eight 1000-candle power units.

**CARSON CITY, NEV.**—The public service commission has denied the Nevada-California Power Company authority to discontinue operation of its electric power line from Lundy, California, to Nevada districts, excepting Fairview and Wonder.

**PRICE, UTAH.**—The Spring Glen Light & Water Company has recently been organized, with an authorized capital of \$10,000, in shares of \$100 each. Water is to be brought from Price City, and electrical energy from the Utah Power & Light Company.

**TWIN FALLS, IDA.**—Indicative of continuing growth of Twin Falls, is the fact that the installations of meters here by the Idaho Power Company during the year ending March, 1920, amounted to 360 more than for the preceding year. There has been no decline in the demand for electric service during the past several weeks.

**RUPERT, IDA.**—A delegation of business men met with the city council recently and urged that the cluster system of street lighting be put into effect instead of the single standard in use at present. The proposed plan of lighting will cover the avenue leading to the depot and will make Rupert one of the best lighted towns in the state.

**OGDEN, UTAH.**—Applications have been filed with the Utah State Engineer for permission to divert 200 cubic second feet from the Ogden river. This project involves eight miles of ditch, when the water will be dropped into the river again under a four hundred-foot head to develop 3750 kilowatts, which will be utilized for irrigating pumping in the vicinity.

**PARK CITY, UTAH.**—Electric lighting service was connected at the towns of Hoytsville and Wanship during the latter part of April. These towns are prosperous farming communities, and the extensions for electric service have just been completed by the Utah Power & Light Company. Celebrations were held in both towns, proclaiming the advent of electric service.

**SALT LAKE CITY, UTAH.**—Sugarhouse, a suburb of Salt Lake City, has just made an installation of thirty-two 300-watt type C lamps, which has done much in the way of improving the lighting in this enterprising community. The business men declare that no one thing, for similar outlay, has done so much to improve and advertise the section as has the installation of this electric lighting.

**RED LODGE, MONT.**—The Carbon county high school is now conducting a night school for men employed in the mines here with success that bids fair to become one of the most important departments of the school. The course is one in the fundamental principles and the simpler application of electricity. Practically all the mine electricians and several of the leading electricians of the city are taking the course. The members of the present class will form an advance class in electricity next year.

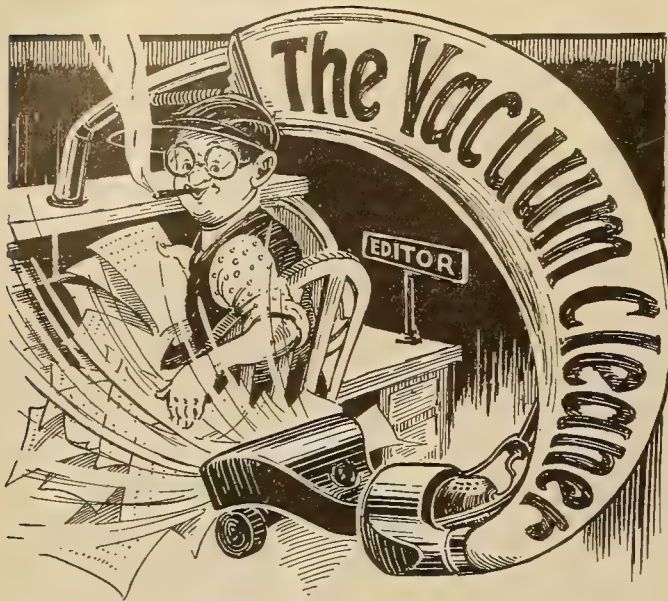
**SALT LAKE CITY, UTAH.**—The Utah Power & Light Company, according to the company's manager at Montpelier, Idaho, W. B. Trowbridge, is planning a big building and expansion program for this spring and summer in its northern Utah and southern Idaho territory. Added improvements and enlargement of the Lifton pumping station are among the plans of the company. This pumping plant is one of the largest in the world, and is used during the irrigating season to keep the waters of Bear river up to normal flow and better, if necessary, during the heavy drain of the irrigation season.

**IDAHO FALLS, IDAHO.**—One of the most complete and successful reclamation by irrigation projects of this part of the country is nearing completion. This new project includes 2000 acres on the west side of the Snake river between the city of Idaho Falls and the town of Roberts in Jefferson county. Some of the best land in Idaho—over 2000 acres of it—has been brought under irrigation by this project and the land is ready today for the seed and success. The pipe line and pumping plant are installed and the water is ready and waiting for the land. The electric power to set all in motion awaits but the closing of a switch. The soil is said to be the best of the lands in the upper Snake River Valley. With the closing of a switch or two, big motors will drive 16,000 gallons of water per minute on to the now arid soil.

**COLORADO SPRINGS, COLO.**—The state public utilities commission and the Colorado Springs city council, on May 22 or 24, will conduct concurrently a hearing on the application of the Colorado Springs Light, Heat and Power Company for an increase in rates for both gas and electricity. The company recently granted a wage increase of 25 per cent to its employees, and officials of the company assert that it is necessary that the operating revenue be increased.

More than 200 electrical experts attended a meeting of the electrical bureau of the Civic and Commercial association of this city when the first steps were taken in the movement to "electrify Denver." W. L. Goodwin and H. B. Kirkland of the General Electric Company of Schenectady, N. Y., and S. A. Chase of the Westinghouse Electric and Manufacturing Company delivered addresses urging the adoption of a cooperative policy in advertising and merchandising among the electrical supply dealers of the city. The campaign which is to be opened in Denver is a part of a national program which has been launched under the supervision of the electrical manufacturers.





The electrical home idea sounds simple and matter-of-fact enough, but its advocates are wont to plunge into elaborately poetical rhetoric, where they wallow joyously and without shame in the strangest of metaphors. At the close of a sales conference a speaker was summing up in his usual eloquent manner. "Gentlemen," he exclaimed, "the office personnel is always at your service. It is up to yourselves entirely. If in your search for fertile fields you come across a prospect rich with pollen, but do not feel quite sure of yourself, call upon me, so that like the bees we may go out together, and gathering in the honey, bring home the bacon."

Education by mail is a commonplace these days, but wives by mail has not yet become the order of the day. A California mail order house is in receipt of an order which came through the mail, on the regular order blank. Under "Quantity" was "1," under "Sizes, colors, etc.," are the words "Medium built, white." The "article wanted" is "A woman between twenty and thirty years of age." The man sending the order writes that he is "A bachelor, thirty-two years of age, and a Protestant."

Following instructions is an art which may be more entertaining than it sounds. A man working for a railroad was told by the superintendent to go along the line looking for wash-outs. "And don't be as long-winded in your next reports as you have been in the past," said the superintendent; "just report the condition of the roadbed as you find it, and don't use a lot of needless words that are not to the point. Write like a business letter, not like a love letter." The man proceeded on his tour of inspection and when he reached the river, he wrote to the superintendent:

"Sir:—Where the railroad was the river is."

Natural history, we have heard, is better for the young when acquired by observation than when learned out of books. It is certainly better for the old, as evidenced by the following essay on a cow, written by a small boy:

"A cow is an animal with four legs on the under side. The tail is no longer than the legs but is not used to stand on. The cow kills flies with her tail. A cow has big ears that wiggle on hinges, so does her tail. A cow is bigger than a calf but not as big as an elephant. She is made small so she can go in a barn when no one is looking. Some cows are black and some can hook. A dog got hooked. She tossed the dog what worried the cat that caught the rat that lived in the house that Jack built. Black cows give white milk; so do other cows. Milkmen sell milk to buy little girls dresses

which they put water in and chalk. Cows chew cuds and each cow furnishes her own chew. That is all there is about cows."

\* \* \*

Speaking of mentality, few of us can claim the formidable list of attainments attributed to a certain visiting negro divine, who was introduced to the congregation by the pastor as follows:

"Brethren and sistren: You-all is gwine lissen today to de interpolations of de Scripcher by a man of de mos' unusuales' containments. Our visitin' brother knows de onknowable; he thinks the unthinkable; and he kin onscrew de onscrutable!"

\* \* \*

Electrical advertising is designed to appeal to a very large class of buyers, and we are glad to see it, but one must draw the line somewhere. The following sign, for instance, recently displayed by an electrical dealer, does not seem calculated to attract customers of the highest moral calibre:

"Don't kill your wife. Let our washing machine do the dirty work."

A neighboring restaurant, also concerned with domestic felicity, takes a more kindly attitude and advertises as follows:

"If your wife can't cook, don't divorce her. Keep her for a pet and eat here."

\* \* \*

There is a silver lining to every cloud, according to the optimists, and even if the cloud happens to be a quarantine sign it's right if you are on the right side of it.

During an epidemic in a small Southern town every infected house was put under quarantine. After the disease had been checked, an old negress protested vigorously when the health officer started to take down the sign on her house.

"Why, Auntie," exclaimed the officer, "don't you want me to take it down?"

"Well, sah," she answered, "dey ain' be'n a bill collectah neah dis house sence dat sign went up. You-all let it alone!"

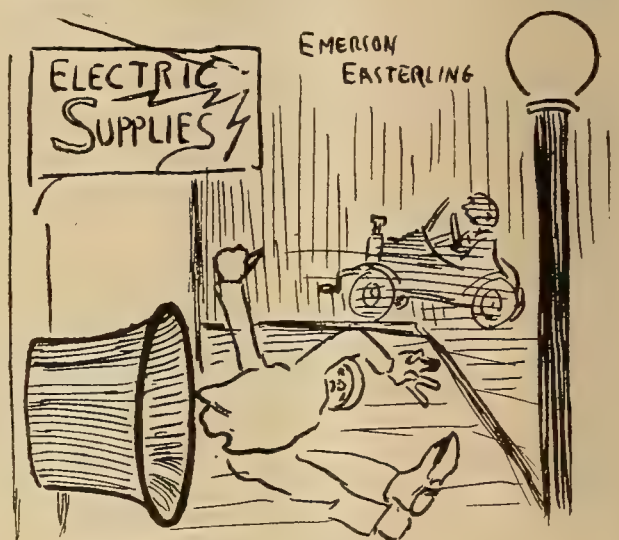
\* \* \*

"Each in his own tongue is a sentiment which has evidently spread outside the realm of poetry:

A bellhop passed through the hall of a hotel whistling loudly. "Young man," said the manager sternly, "you should know that it is against the rules of this hotel for an employe to whistle while on duty."

"I am not whistling, sir," replied the boy, "I'm paging Mr. Jones' dog."

\* \* \*



DRAWING CROWDS TO A SIDE STREET LOCATION

Why waste your money on electric signs? It seems that the article which appeared in the March 15th issue of the Journal of Electricity advocating this process is now out of date in view of the latest methods. A giant vacuum cleaner discreetly operated will bring all kinds of business to your very door. No one will be able to resist the attraction of your establishment, and even the most casual passer-by will feel irresistibly drawn towards it.



# JOURNAL OF ELECTRICITY

VOL. 44 NO. 11

SAN FRANCISCO, JUNE 1, 1920

PER COPY, 25 CENTS



## Steady Repetition

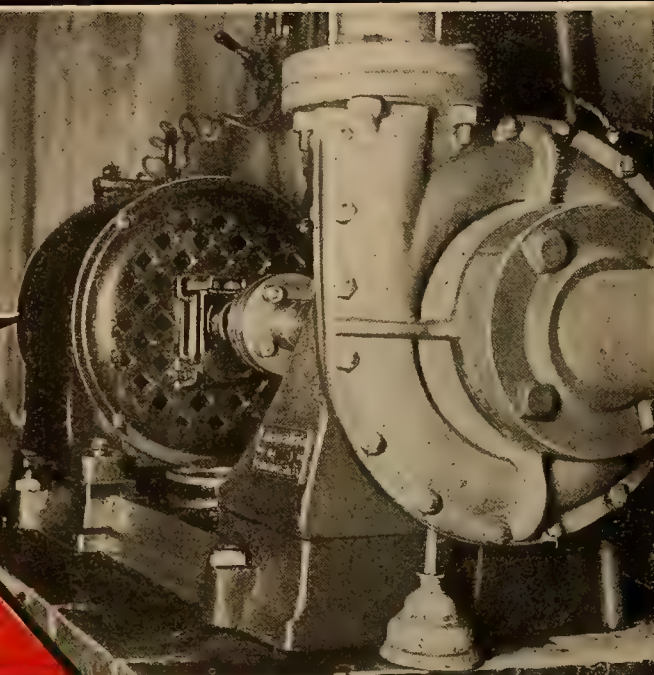
THE report of this installation of a single Wagner Motor is but representative of the repeated commendation of our customers. As will be noted, the Wagner Motor is directly connected to a centrifugal pump forcing 125 gallons of water per minute against a head of 15 feet.

Working day in, day out, 8 to 10 hours per day, 6 days a week *without repairs or special attention of any kind* and requiring only a new set of bearings after fourteen years of almost continuous operation—such is the heritage of Wagner Motors.

The letter tells the complete story repetition of what thousands of small and large motor users have told—the story of Wagner, Quality.

If you have alternating current motor-drive problems, let us tell you more about Wagner, Quality.

## Wagner Electric Manufacturing Company, St. Louis



AMHERST COLLEGE  
AMHERST, MASSACHUSETTS  
OFFICE OF THE TREASURER

H. W. WOODEN, TREASURER

September 12th 1919

Wagner Electric Mfg. Co.,  
88 Brookline Ave.,  
Boston, Mass.

Gentlemen

In the matter of the bronze bearings. Please send us a complete set of bronze bearings, with oil rings, for type "1-B", 2 H.P. This motor has been in continuous service since about 1905. It pumps water at the rate of 125 gallons a minute against a head of about 15 ft. It is required to work from 8 to 10 hours six days in the week almost steadily through the year and some times it has to work on Sunday. So far as I can now recall, this is the first repair we have ever had to make on it.

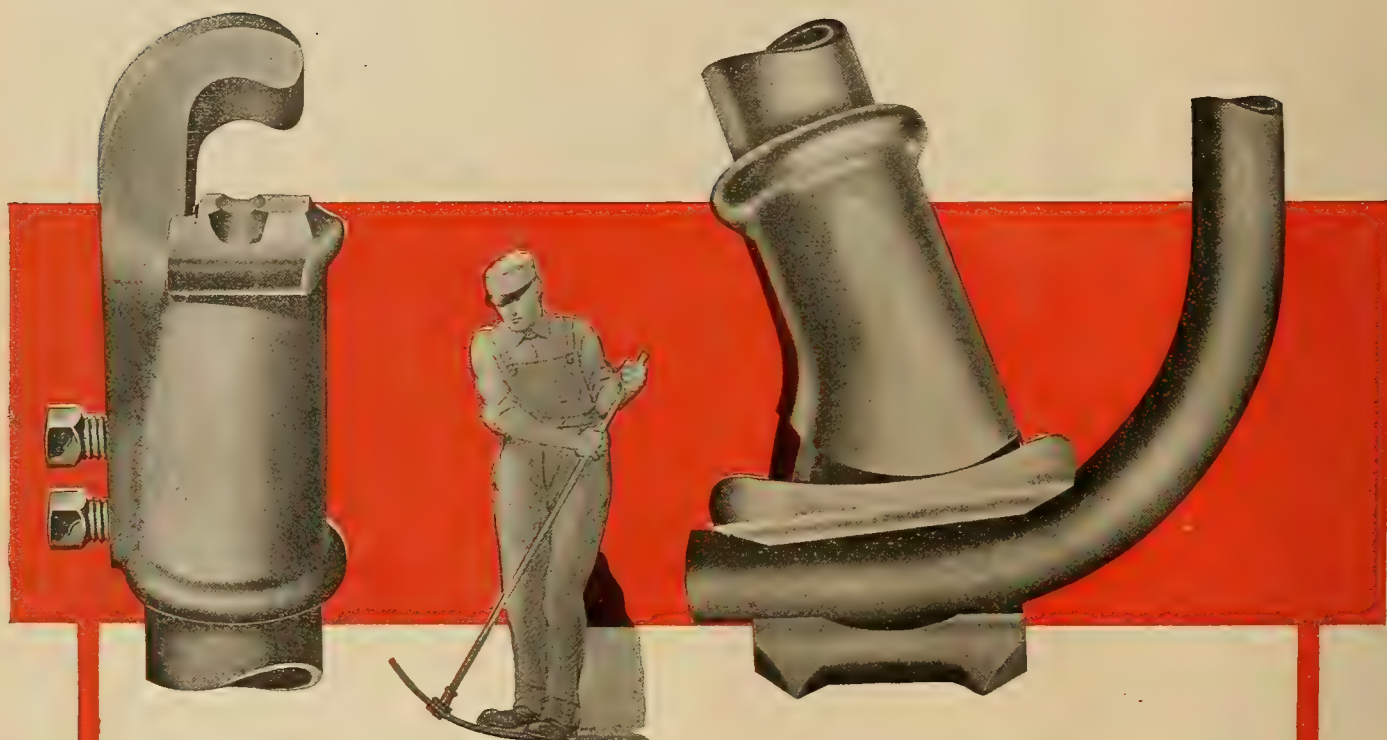
Yours very truly,

H. W. Wooden  
Treasurer



# *The* FEY AUTOMATIC GRIP HICKEY

"STICKS WHERE IT GRIPS"



## Bends Pipe Quickly

*No Kinking—No Breaking—No Flattening*

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San Francisco, Calif.



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ROBERT SIBLEY, Editor

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NUMBER 11

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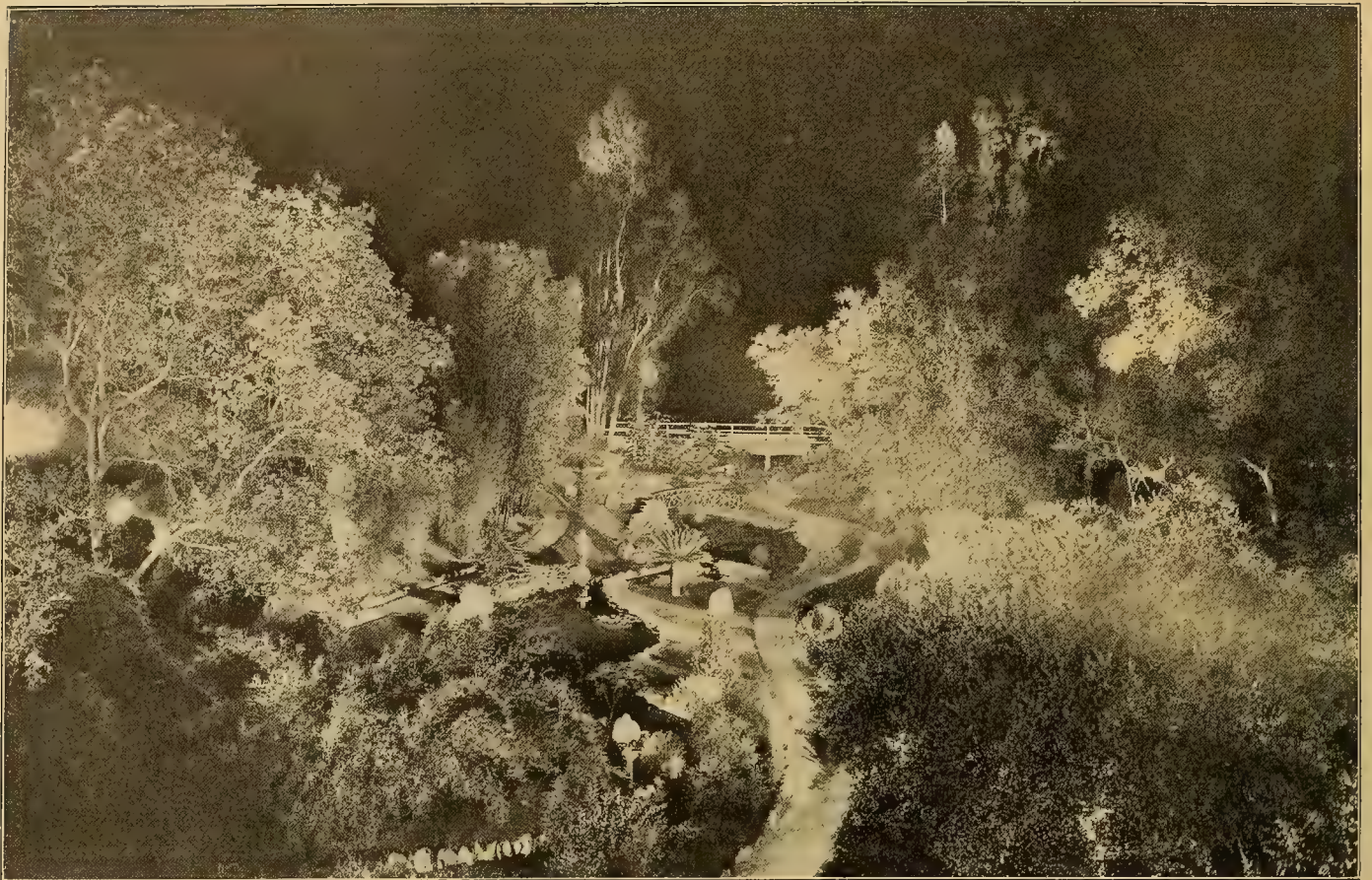
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**O**UT from this garden creation at the great Convention of the National Electric Light Association at Pasadena came a thousand wonders of exquisite beauty. As electricity made possible this wonderful scenic effect, so will it make possible an ever increasing beauty and progress in human affairs for years to come, as a result of the magnificent papers and discussions accumulated at the convention sessions, the enthusiasm instilled in those in attendance, and the vision of possibilities of helpfulness to mankind with which all felt imbued as they left the Convention hall at Hotel Huntington, May 22, 1920.





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

SAN FRANCISCO, JUNE 1, 1920

Number 11

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## ECHOES OF THE CONVENTIONS

**N**EVER before in the history of the West have three gatherings proven of such unusual helpfulness as have those of the month just closed. So many and so varied were the splendid ideas brought out in formal and informal discussion in the convention halls, and upon the vast highways of California where convention delegates went to see what we had to offer in the West, that it is difficult indeed in a few words to give an adequate idea of the great good resulting from these gatherings. The outstanding features of these three conventions is the evident desire on the part of the men of the electrical industry to maintain sincerely the highest ethical standards in service to the nation, to sense the needs of industry, and to supply these needs at a reasonable return for such service, thereby bringing about the fullest and best development.

In actual discussion the outstanding features proved to be that railway electrification in the march of progress is an assured fact; that the financial return for service is secure when a utility is earnestly and steadfastly endeavoring to render to the public the highest type of service; and finally, that the vast water powers of the nation must be unloosed, and that the problem of financing will be solved through the cooperation of a sympathetic public, reasonable in its attitude, and fully appreciative of the unlimited possibilities of good to industry that may be brought about through the self-interest idea when the water powers of the nation are fully developed.

By reason of these outstanding features, 1920 will go down in history as the most eventful in all the years of the electrical industry—the year of the meeting in the West of the National Electrical Supply Jobbers' Association, the Pacific Coast Section N. E. L. A., and finally the National Electric Light Association, the master convention in this year of years in conventions electrical.

It is difficult to fully appraise the far-reaching effect that will be felt, not only by the electrical industry, but in every phase of industrial and civic development of the nation, as a result of the wonderful gathering that has just completed its sessions in Pasadena. Coming at a period in our national development when the industry is shaken to its innermost, and people generally are uncertain as to the future, the authoritative data on water power, the new vision of utility regulation sponsored by two of our foremost regulating commissioners, the promulgation of ideas and practical idealism in utility service by one of our best known authorities, the presentation of statistical data on electrification of steam railways, the pronouncement of public policy visualized by John A. Britton, dean of our industry, the setting forth of cooperative ideals that go toward making a better and more useful industry, and the magnificent setting of a convention in a country teeming with possibilities and accomplishments—all these things will go down in history, making a record of the National Electric Light Asso-

### Greatest Electrical Gathering Ever Held in the West

ciation Convention in Pasadena as the greatest and most helpful of its kind ever known in the history of our industry.

It is difficult to thank individually all those who had a part in this wonderful work at Pasadena, but to R. H. Ballard, the fountain head, who so earnestly, faithfully, and constructively worked during the past year for its accomplishment, the nation at large must ever owe a debt of gratitude.

While the labors of the Pacific Coast Section, N. E. L. A., insofar as convention activities are concerned, were subordinated to the greater and bigger task, that of making a successful national gathering of the Association in Pasadena, yet there will remain in the minds and hearts of those present at the recent Pasadena convention a lasting impression of the wonderful year of accomplishment that this Pacific Coast Section, N. E. L. A. has recorded. Pre-eminently, and above all else, will go down into history two outstanding features, the one the crystallization of the geographic

### The Pacific Coast Section N. E. L. A.



section idea as a national unit in Association efforts, and the other, that the self-interest appeal is the only sane and secure method whereby vast sums of money for utility finance may be acquired in the future life of the industry. To the establishment of these two ideals in the industry the Pacific Coast, and indeed the industry at large, will ever feel indebted to A. Emory Wishon, president of the Association, who so ably fulfilled the duties incumbent upon him during the past year.

In this day of financial uncertainty and the demand for vast sums of money to be invested in the electrical utilities throughout the nation, the addresses of E. O. Edgerton, president of the California Railroad Commission, and of Carl Jackson, president of the Wisconsin Railroad Commission, given before the recent Pasadena Convention of the National Electric Light Association, will long linger in the minds of those who heard them, and for years to come they will undoubtedly serve as the basis upon which constructive regulation must be built in order to make possible the fullest development of our industry. A profound impression will be created in the industry throughout the nation when full realization is given to the fact that Mr. Edgerton deduces all his logical conclusions from the premise that it is to the interest of the consumer and to the public at large that the great electrical utility institutions of our nation be kept financially sound. Fully admitting that the financier needs inducement to invest his funds in these securities, he forcefully brings out the point, however, that no such inducement as would call forth exorbitant or unreasonable rates could ever be approved by a regulatory body. But the thing that made a profound impression upon all was that he considers assets of a utility as consisting not alone in physical units of power houses and transmission lines, but greatest of all, that electrical energy itself constitutes a vital and essential service to the people, and as a consequence presents the most lasting and enduring asset that can possibly be offered for any security.

In the last issue of the Journal of Electricity was concluded a series of articles under the authorship of S. M. Kennedy on the subject of Public Relations. These articles have created such a profound impression, not only throughout the industry in the West, but throughout the nation, that we should feel we had failed in our duty unless at this time we expressed not only the appreciation and gratification of the Journal of Electricity for this able work of Mr. Kennedy, but also the appreciation of men of the industry in all parts of the country. Mr. Kennedy, perhaps to a degree equaled by no other living individual, possesses the ability to sense the need for service, to visualize this need and then to put it into words so that the executives, the employes and the man in the street may gather a clearer and more inspiring vision of the great need for service in this present

generation. It will, as a consequence, come as good news to men of the industry everywhere to learn that at an early date the entire series of articles by Mr. Kennedy—which includes the twelve articles that have appeared in the Journal of Electricity; the "Man in the Street," which made such a profound impression at last year's convention of the Pacific Coast Section N. E. L. A.; and the wonderful contribution he has made to the proceedings of the recent convention of the National Electric Light Association at Pasadena on the subject of Service,—will appear in bound form. From indications received from many regulating commissions, from public utilities and from men of the industry throughout the nation, we believe that this work of Mr. Kennedy's will become a classic authority on public relations.

That Mr. Kennedy's paper at Pasadena should have received the rousing response from the convention that it was accorded, and that Commissioner Edgerton in his address which immediately followed Mr. Kennedy's paper alluded to it as the basis upon which utility service should be built, came as no surprise to those who have followed his writings.

One of the striking features brought out at the recent Electrical Supply Jobbers' Convention at Del Monte was the marked emphasis placed upon the necessity for business houses having a definite sales policy in business organization. E. W. Rockafellow of the Western Electric Company even went so far as to state that, though such policy be in error, it is far better than no policy at all, for at least it gives a basis upon which the business world may work.

Too often in the past the various organizations in our industry, by hit-and-miss pronouncement of policy, have created uncertainties and vague ideas of business responsibility throughout the country. We commend in the highest terms the effort of Mr. Rockafellow in his endeavor to impress his hearers with the necessity of the institution of sales policy.

From every quarter congratulations have poured into the offices of the Journal of Electricity over its part in getting out the convention dailies entitled "The Roundup," "Council Fires" and "Western Gold," which were dedicated to the recent convention by the McGraw-Hill Electrical Trio—Electrical World, Electrical Merchandising and the Journal of Electricity.

Perhaps the question of accurate registration lists has been a subject of more comment than any other in calling forth congratulations. There was in attendance at the convention a record-breaking enrollment, the complete list of names totaling practically 2,500. Of this list, the complete enrollment of men was shown in the first issue; in the second issue, where confusion ordinarily begins, only three omissions of addresses were shown; while in the third, of the total enrollment given under the most confusing situation, but twenty-two names showed incomplete address registration.

### Constructive Utility Regulation

### A Sales Policy Plan

### Registration and the Convention Daily

### S. M. Kennedy— a Tribute



The Journal of Electricity wishes to take this occasion to thank all those who so kindly and cheerfully helped us in this work, and we are sure that our two companion papers, *Electrical World* and *Electrical Merchandising*, join us in this thanks to the industry for their hearty cooperation.

Throughout the state of California and other districts of the West there is a movement growing which might be called Development of Cooperative Buying Associations. This is particularly active among the farmers. We find such in the Ukiah Farmers Club, the Fruit Growers Supply Company and the Orange Growers Association. Some of these associations have quite far-reaching activities; some have actually gone into manufacturing.

One of the objects of these associations is to employ their collective buying power to the benefit of the individual member. This means that the associations' buying power is employed to secure large-buyers' discounts for the benefit of the individual small-buyer, only a very small percentage being charged to the individual for the cost of handling the negotiation.

In the case of motors, the associations have been asking the electrical manufacturers for motor agency agreements which give them discounts of 15 and 5%. The association keeps the 5% discount and turns the goods over to the individual farmer at a price equivalent to 15% discount; whereas the individual going into the open market would have to pay net retail.

There is no doubt but that these associations get the goods cheaper for the farmer than he otherwise would get them, but the buying of electrical goods does not stop there. Motors, for instance, must be installed and wired up; they must be properly protected from overloads and under-voltage; they must be put in to comply with fire and safety laws. In the case of trouble some electrical man has to be depended upon to give service.

When a manufacturer is successful in making an agreement with one of these buying associations, there is no doubt but that the manufacturer gets a very nice volume of business at relatively low expense. But in consideration of the support which we all are giving to the California Electrical Cooperative Campaign and to the work of the jobber and contractor-dealer associations, it seems rather inconsistent for us to encourage and foster the further development of these cooperative buying associations, unless every ethical standard and quality of service be rendered to the industry by these associations that is now so prevalent in all the various branches of the electrical industry throughout the West.

The electrical dealer and contractor particularly should be afforded every possible opportunity to handle all the electrical business that goes into his territory. Therefore inasmuch as the farmer ultimately has to call in the electrical contractor and dealer to install his motor, wire it up, provide it with

protective devices, and see that it meets the fire and safety laws, it seems only right that everything should be done to discourage the cooperative buying associations from handling electrical goods. On the other hand, we should do everything possible in the industry to stand together and encourage the farmer to buy through his local electrical man.

In the final analysis this means that adequate and proper electrical goods will be sold to the farmer. He will get what is most needed by him rather than what he thinks he may want. He will get the goods at a fair price, properly installed mechanically and according to the law, and in the end this will not cost him any more money than he otherwise might pay.

The electrical manufacturers can of course do much to help this situation in not offering these buying associations preferred discounts. On the other hand the electrical contractor and dealer must sell to the farmer the idea that he has a service to render which is worthy of the farmer's consideration in the first cost.

With this Echo Issue of the Journal of Electricity ends a fiscal year of activity for 1919-1920.

#### A Year of Significant Achievement

Powerful issues of the Journal that have been sent forth to the industry during the past two months, particularly our convention issue of May 15th, 1920, have won commendation and appreciation from every nook and corner of the nation. It is fitting then to review briefly the activities of the Journal of Electricity during the past year.

Serial articles such as those by S. M. Kennedy on public relations and by Dr. A. C. Crehore on the New Physics have taken the Journal of Electricity into commercial departments of the central station on the one hand and into scientific and engineering thought on the other to an extent which has surpassed our fondest expectations. In the matter of hydroelectric practice and fuel oil and steam engineering the Journal has continued to evoke interest from all parts of the world where these matters are of importance.

Our courses through the university extension division of the University of California have been followed far and near, and we feel no small sense of pride in the fact that both the students in these courses and the university authorities themselves have expressed their appreciation of the helpfulness of the Journal of Electricity in spreading the educative idea.

Our chronicling of Builders of the West has set, in the written record of leaders of the day, new standards in ideals for generations to come. Our news columns and personals have a certain sense of "home" that has won over the hearts of Western readers by the thousands, and have today secured for the Journal of Electricity a warm place in the heart of the electrical industry west of the Rockies. And yet, this is only a beginning; the next year must see us go forward to new planes of achievement. Already our plans are being laid for accounting



courses with the University of California, for studies in water power research, for investigations of new and unusual uses of electrical energy and for effective aid to the contractor-dealer in his merchandising efforts throughout the West. Coupled with this we shall continue to have technical and scientific articles of high value, and thus we shall extend the influence already held in the scientific and engineering world by the Journal of Electricity. And above all, the editorial force and power of the Journal will be broadened. Its opinion is even now sought by regulating bodies, executives of power companies and others in authority. With its sincerity of purpose, the Journal of Electricity has ever gone about its task of helpfulness to the industry, and it pledges itself to this same conscientious endeavor in the future, for due to this sincerity of purpose alone we credit the splendid stand its editorial pen holds in the community at large today.

In a recent issue of the Journal of Electricity attention was called to the advantages which might be gained by group-action in financing.

#### Group Financing

The public is quite familiar with group action as taken in the past, particularly with reference to merchandising those products which are produced by a number of persons or firms engaged in the same field. These group actions have proven very satisfactory, both from the viewpoint of the producer and from that of the consuming public. The public gain the advantage of a product of the reliability of which they feel assured as it is backed by the resources and good-will of a large group, mutually interdependent for their continued prosperity. The producer gains in that his product is accepted with less question, coming as it does with the reputation of the group behind it. His products are placed on a par with all the others of the group, and in his campaign he is able to avail himself of the counsel of the most competent advisers.

The power companies of the West, and of California particularly, would do well to make use of some of these lessons. For years ahead it will be necessary for companies in California to seek \$50,000,000 per annum of new capital for extensions and investments. Inasmuch as they exist and operate under similar conditions, the matter of their financing might well be done by group action. Each company generates power by water; transmits it over long high voltage transmission lines; serves the same general character of consumers; receives approx-

imately the same rates; is regulated by one commission which has adopted the attitude of allowing a reasonable return upon the investment and issued securities, and each investment per kilowatt capacity is the same within reasonable bounds.

Of course, the ultimate of group financing is a merger of the corporations or the formation of a holding company which would underwrite the securities of the corporations in the district. The latter might prove most feasible in that the companies would not wish to lose their corporate identity. Through the underwriting of the securities of the district by one large responsible concern, the public would gain the information, and that correctly, that the prosperity of one company was the prosperity of another and that the resources behind one issue of securities was the combined resources of all of the companies in the group. By the adoption of some such plan it is believed that one of the great difficulties ahead in the question of finance will be eliminated.

In order to operate oil burning boilers at high capacity, it is necessary to provide ample furnace

#### Large Furnaces for Fuel Oil Burning

volume. With the usual type of steam atomizing burner it is possible to burn as high as six or seven pounds of oil per hour per cubic foot of furnace volume, but for the best efficiency the quantity should not exceed three or four pounds per hour per cubic foot. There are two ways by which the furnace volume can be increased; one by lengthening the furnace and the other by raising the boiler. As an instance of this let us take one of the common types of boiler, such as the Babcock & Wilcox design. In this particular design, a larger furnace can also be obtained by moving the bridge wall back to the mud drum and placing the burner there. This gives the furnace the full length of the tube, the bottom tubes being covered with tile from the rear headers to the front baffle to prevent the gases by-passing direct to the third pass of the boiler. In other types of furnace, such as the Hammel, increased volume is obtained by raising the boiler a few feet higher than the standard height.

With such excessive demand for increased boiler capacity and the inability of manufacturers to supply new boiler equipment within reasonable time limits, the subject of increasing the furnace capacity is one of vital and timely moment, and, as a consequence, engineers may well give some thought and consideration to present installations, and to methods by which furnace volume may be increased with the least expenditure possible.

## JUNE 15th---SPECIAL FOREIGN TRADE ISSUE

Report of the Seventh National Foreign Trade Convention

Power Developments in the Orient in connection with Mining Projects

The Fluctuating Dollar and Foreign Trade

Railroad Electrification in South America

Power Development in Scandinavia



## Pasadena Convention, N. E. L. A.

(Twenty-five hundred men from every section of the nation and from every branch of the electrical industry gathered in Pasadena for the five days, May 18-22, to attend the 1920 convention of the National Electric Light Association. The data presented there on national water power, railway electrification and advance in ideals of cooperation, public utility service and commission regulation, has made the convention an event of widespread and lasting inspiration for the entire industry.—The Editor.)

Unquestionably the electrical industry will be stirred from east to west and from north to south in its national life due to the splendid work of the recent convention of the National Electric Light Association at Pasadena. Many prophesied it would be a successful affair, but few dreamed that such powerful data on water power statistics, railway electrification, cooperation in the industry, new advances in commission regulation, and new ideals in utility service would be brought out to such a marked degree. It is difficult to fully recount the names of those who had a constructive part in this work, for such team-work characterized the convention in its preparation from start to finish. It would seem unfitting, however, to pass by unspoken the names of C. H. Peirson, in publicity efforts; K. E. Van Kuran, in ladies' entertainment; A. E. Wishon, having in charge Pacific Coast Section night; A. B. Wollaber, who did such splendid work on the hotel committee; W. L. Frost, who was at all times, together with his good wife, in the foremost ranks in planning entertainment features; S. M. Kennedy, whose masterly hand in program arrangement was observable on all sides; A. E. Morphy and John B. Miller in general convention committee activities, one of which was the wonderful reception at the Miller home where Mr. and Mrs. Miller proved such charming host and hostess; to M. H. Aylesworth for his dispatch in executive detail; and, finally, to R. H. Ballard, the wonderful organizer and genius of the past year in N. E. L. A. activities. All these men have won an enduring and lasting debt of gratitude from the industry at large and to them the Journal of Electricity would extend with men of the industry in the West their heartfelt and cordial appreciation.

The keynote of the convention, aside from the wonderful ideals and cooperative helpfulness which permeated every activity and every ideal expressed was the question of financing, and so ably and so well

did Commissioner Jackson, president of the Wisconsin Commission, and Commissioner Edgerton, president of the California Commission, express their views on utility problems of the day that men of the industry have taken new hope, and it may truly be said that the outcome of this great convention will be a sound optimism for utility finance for the future, all of which may be well summed up in the words of S. Z. Mitchell, president of the Electric Bond and Share Company of New York City, who, having heard throughout, the discussions and addresses of Mr. Edgerton and Mr. Jackson, impressively spoke as follows:

"Mr. Chairman: I have been greatly impressed with the analysis of the situation as set forth in the remarkable papers read by Mr. Jackson and Mr. Edgerton at this meeting. During the past few years I have been discouraged at times over the final outcome of public regulation because under it such a large number of public utilities have been facing slow death through starvation. This has been due no doubt, in a few cases, to politics, but principally to a lack of appreciation—particularly on the part of the newer commissions—of the difficulties involved in the practical operation of utilities. The papers read here by Mr. Jackson and Mr. Edgerton give us new hope and are most encouraging. They show conclusively that these gentlemen are fully informed as to the difficult problems from both the public and the company's standpoint and that they have accurate and positive views as to the procedure which is necessary to get best results in the public interest. This means for the best interest of the companies as well, because under proper regulation everything that is for the public interest must of necessity be for the company's interest. The greatest, and in fact the principal difficulties in the way of public service progress today are due to antiquated and unworkable laws which do not fit modern conditions and also that lack of elasticity and quick responsiveness to rapidly changing costs of everything, including money, which has caused the public to lose confidence in a large measure in the stability and safety of public utility investments. If the practical suggestions made here by these men are adopted and made effective by all the regulatory commissions there will be an astonishing re-establishment of public confidence and favor for utility investments. This will mean that utilities can obtain, under normal conditions, much larger amounts of capital than has ever heretofore been possible and at much lower rates than under the present conditions. This will mean a saving to the people of a sum which, capitalized at 6%, will amount to much in excess of one billion



In case you could not pick out your friends in the big group picture, try these two sections, snapped by our photographer while they were waiting for the panorama camera-man to say, "All still, please."





N. E. L. A. CONVENTION DELEGATES AT THE HOTEL HUNTINGTON, PASADENA.

dollars. This is of great public interest and is especially important in view of the imminent passage by Congress of the water power bill and the enormous demand to follow for additional capital in order to conserve coal and oil and the labor and transportation charges incident to the use of same. I feel that every citizen is indebted to these gentlemen for their clear enunciation of the correct principles involved in utility regulation."

### BUSINESS SESSIONS

With the electrical industry standing at the threshold of a new era of development following the upheaval of the war, the recent convention of the National Electric Light Association was one of especial significance in the importance of the problems discussed and the decisions arrived at. The problem of financing the extensive construction needed to meet the requirements of the nation, the coming question of railway electrification and the development of our water powers which will be opened up by congressional legislation, as well as increased activity in association affairs through the growth of the geographic section idea were matters which were ably discussed and upon which action was taken which shall have a far-reaching significance in the developments of the coming year.

The convention was opened by Governor Wm. D. Stephens, who offered the hospitality of California and expressed the appreciation on the part of governing bodies of the importance of the electrical industry to the West.

### The President's Address

The keynote of the convention was sounded in the forceful report of President Ballard, whose recommendations in detail were approved and commended to the attention of the organization by the committee reporting at the last session. Brief extracts from this report are here given:

#### Financial Situation —

The industry needs approximately \$750,000,000 of new capital right now to care for the expanded requirements of the country, and the ability of the utilities to raise this large sum of money hinges on the earning power of the investment, the economic soundness of proposed developments, support of public utility commissions, favorable opinion of the public at large and the extent to which our securities are forced to compete for favor in the general money market.

#### Public Ownership —

The kind of public ownership which brings results is ownership by the public at large in the stocks and bonds of their local regulated utility companies. This forms a part-

nership which leads to complete understanding and cooperative effort in development and retains in the management and operation of the utilities those trained by long experience to perform the task.

#### Interconnection of Generating Systems —

The economic growth of the electric utility business lies in larger and more efficient units of production and in their interconnection. Not only does interconnection make for greater reliability and adequacy of service, but it saves fuel and labor, conserves capital and plant investment and improves load factor; thereby reducing the cost of the unit of measurement, which is advantageous alike to the consumer and the utility.

#### Railroad Electrification —

Trunk line electrification has its greatest argument in the future, for with the rapidly increasing cost of fuel and traffic, the ultimate return on any amount now invested in electrification will be more than generous compared with the return on the accumulated amount which might be spent over a long period in patching up the systems. Aside from the greater comfort in travel and the purely operating economies obtainable, enormous savings in coal are possible through electrical operation of the railroads. The central station industry is vitally concerned in such a transformation of our railroad systems, because to it the railroads look for their power supply.

#### Water Power Development —

For over 10 years efforts have been made to get the great hydroelectric resources of the country released for beneficial development under proper safeguards. Both Congress and the executive departments have recognized for years the inadequacy of existing laws; and although developments subject to revocable permits have been and are being made on the public domain, no development on navigable streams has been authorized by Congress since 1912. Thus three-quarters of the country's hydroelectric resources are either locked up or are so involved as to discourage development.

It requires on the average 1000 tons of coal to produce 125 hp.-years of electricity, so that 35,000,000 undeveloped water horsepower put to use would save the necessity of mining 280,000,000 tons of coal a year, the labor of from 500,000 to 750,000 men, and release 600,000 freight cars and 20,000 locomotives and equipment which is sadly needed for the transportation of products other than coal.

#### Association Affairs —

Plans have been made to strengthen state and geographic sections and to coordinate their activities with those of the national body. Moreover, much of the work formerly done by the national association will be delegated to the geographic sections, where regional questions can be better discussed and where national policies can be interpreted and modified to meet conditions. It is reasonable to expect that within the year the entire country will be organized along geographic lines.

It is proposed also to divide the work of the association among four national sections—public relations, technical, commercial, and accounting. The last three, which are now functioning, will be somewhat revamped, and the public relations section is entirely new. It will take up matters of public relations, regulation, finance and kindred managerial topics. The national executive committee will also be formed on more representative and democratic lines.





THE CONVENTION ATTENDANCE WAS OVER 2500 ON THE LAST COUNT.

#### Cooperation —

That one branch of the industry can prosper independently of the other is a fallacy. In the West, a great plan of cooperation of all the branches of the business has been worked out and put into effect in a satisfactory manner. This broad cooperation is commended for your earnest consideration because it will not only bring about sound financial benefits, but will assist us in giving that high standard of service to our consumers which is the object and aim of all properly conducted utility companies.

#### Report of Executive Manager

Extensive changes intended to simplify the organization of the national association and to foster the geographic section idea have been worked out by the present administration and were presented to the society by the executive manager, M. H. Aylesworth, receiving the enthusiastic support of the society.

Aside from a reorganization of the headquarters staff with a particular emphasis on the carrying on of publicity work, the most important division of this report was concerned with the development of the geographic section.

The field work carried on since October 1st not only has demonstrated that the work of the national association should be decentralized to a considerable extent and that the country should be divided into geographic divisions, but that there is a unanimous demand for the program of the Geographic Sections Committee, which provided for the division of the country into thirteen geographic divisions, including Canada, as defined and named on the accompanying map. The National Executive Committee, on its own motion or upon the application of one or more adjacent geographic divisions, may modify the boundaries or add to or subtract from the existing number of geographic divisions.

The plan as adopted provides for two types of geographic sections, one of which shall be composed of active state organizations and one which shall function as a unit without regard to state boundaries.

Assistance in financing the geographic divisions will be provided upon budgetary appropriation from the dues paid to the National Electric Light Association. The needs of each geographic division, in budget form, will be presented for approval to the National Executive Committee by the representatives of each geographic division upon the National Executive Committee.

#### Report on Water Power Development

One of the most animated discussions of the session followed the reading of the water power report which was given in full in the May 15th issue of the Journal of Electricity. In a discussion in which John A. Britton of the Pacific Gas & Electric Company, and C. L. Eglin of the Philadelphia Electric Company took part, the acute nature of the present situation was brought out, both in the necessity for pressing national legislation and in immediate development of water resources in the interests of fuel conservation. A. E. Wishon, assistant general manager of the San Joaquin Light and Power Corporation, brought out the interest which the public itself has in the development, which should be presented generally to the public in order to facilitate financing of the work to be done. In order that necessary legislation may be pressed and that already adopted carried out along equitable lines, a resolution was passed to continue the present water power committee as a permanent body.

#### Encouragement from Regulating Bodies

With the question of finance looming in such proportions before all the power companies of the nation, the frank discussion of rate regulation and financing problems by E. O. Edgerton, president of the California Railroad Commission, cleared the air and laid the foundation for sound future development. Commissioner Edgerton not only acknowledged the burden upon the regulating commission to reward efficiency where it occurred, but placed the burden for thus providing efficient service squarely upon the companies themselves. He urged the open discussion of the problems of financing, which he regarded as among the most acute which the electrical industry had to face. Expressing his own belief in the soundness of utility bonds as an investment, he urged the necessity of properly educating the public to overcome prejudices already existing. When such rewards do come to the company, they should be passed on down the scale, not being all confined to the president's office, in order that a loyal organization be built up and the public receive in service the advantages of the reward they have allowed. In conclusion he urged the greatest efficiency on the part of power companies as their only safeguard, even to the



extent of the unification as well as interconnection of all companies within a unit area, such for instance as the state of California.

Along similar lines was the masterly address of Carl D. Jackson, president of the Wisconsin Commission, during the third general session, who took a progressive stand on matters of rate regulation which offered encouragement to those contemplating new construction. The present trend of regulation is toward a greater stability, with a recognition that



To live up to their wild and woolly reputation the Westerners staged a realistic hold-up for the unsuspecting Eastern delegates to Pasadena arriving on the Red Special.

the holders of utility bonds are investors rather than speculators and that they should be protected. Taking the position that valuation is only one step in the fixing of a rate base which shall allow a fair return on the capital which has been invested, the commissioner pointed out that from this standpoint depreciation need not be regarded as an essential deduction from the rate base. He also urged the adoption of the indeterminate permit in preference to the short term franchise. In conclusion, he pointed out the necessity of making the public acquainted with the causes which underlie rate changes and urged that such a campaign, carried out by the electrical industry, be conducted with scrupulous impartiality, as only such fair-mindedness could reach the public confidence.

#### The Question of Municipal Ownership

The report of the committee on Electrical Resources of the Nation dealt largely with statistics on municipal ownership. The committee found that there were 2318 municipal plants throughout the country, as contrasted with 4224 commercial stations, which have something like 16 times the generating capacity of the municipal plants. The lower returns obtained by the private plant as well as the much more rapidly decreasing rate of net return stand out most prominently. Most municipal plants exist only where central station service is not otherwise given, and of the 139 cases where actual competition exists, so many of these purchase their energy in whole or in part from the power company that only 116 independent competing plants need be noted, of which 42 furnish energy only for city use.

Two most important recommendations were made by this committee—one on the necessity for

starting a movement which shall encourage the regulation of municipally owned as well as privately owned utilities by their respective utility commissions, and the other, the collecting of statistical data concerning the operation of the electrical industry throughout the country and its publication in an annual statement.

#### Service as a Utility Watchword

Those who have followed the series of articles by S. M. Kennedy, vice-president of the Southern California Edison Company, which have been running through the Journal of Electricity, will appreciate the importance of the message which formed the backbone of the report of his committee on Public Relations at the Thursday morning general session. Mr. Kennedy discussed in his charming way the various aspects of good service, from the uniform worn by the meter reader to the publicity campaign which should help to maintain public good will, with such inspirational effect that those present were roused to great enthusiasm. The keynote of Mr. Kennedy's message may be summed up in one of the concluding paragraphs of his address:

"Just as long as there is a service to be supplied, just so long will there be possibilities for improving service. Service is distinctly progressive. What was good service one year ago, stands a chance of being considered ordinary service today, and what was rated ordinary service a year ago may possibly be considered poor service tomorrow. Through the efforts of thoughtful inventors and energetic engineers, the tangible service has shown constant improvement. The intangible service should also improve, through close study of the needs and preferences of the community, the adoption of advancing methods, and the practice of discernment in considering the personal equation when serving the individual. The aim of the utility company should ever be, not how little may be offered, but how much can be given. Is the question asked, "What are the limitations to good service?" The echoes from past experience, coupled with the call of the future, supply the answer—"There are no limitations." Good service will yet embrace many attributes heretofore omitted, overlooked and for the present undreamed."

#### Inductive Interference

The importance of the inductive interference situation and the necessity for some organized action on the part of the power companies to meet the consistent policy of the telephone company in the protection of their interests, was the plea made by the committee on inductive interference, whose report was jointly presented by J. E. Woodbridge of Ford, Bacon and Davis, and Geo. E. Quinan of Puget Sound Power and Light Company. Cooperation on the part of the telephone company was offered by the representative of those interests who was present and who urged joint investigation into the problem by both

John B. Fiske, consulting engineer with the Washington Water Power Company and president of the Northwest Light and Power Association, brought down an important representation from the Northwest Division who acted as joint hosts to the national convention with the Pacific Coast Section.





parties concerned. An active interest in this most important question was shown by power company officials as well as engineers, and prompt action along needed lines was promised.

### Railway Electrification

From the report of the committee on the electrification of steam railroads which was presented as a symposium from the standpoint of the railroad, the power company, the construction company and the manufacturer, it was apparent to those present that the electrification of the more important lines of our steam railroads was only a question of time and that the real problems concerned were those of practical application. An important warning was sounded by J. A. Lighthipe of the Southern California Edison Company, who pointed out that railway lines as well as power companies are going to want to tie in to one another's systems at a later date and it is not too early to consider the question of a standardization which will make this possible. A. H. Babcock, electrical engineer of the Southern Pacific Company, pointed out the necessity of educating the operating men and executives of the railroad company as well as the electrical engineers of such companies.

### Sale of Stock to Customers

The advisability of keeping public good will through taking the customer into partnership was the theme of both the report of the Committee on Public Information of which John F. Gilchrist is chairman, and of the Committee on the Sales of Company Securities to Customers and Resident Citizens. This method of disposing of company securities is of importance in financing, of course, but throughout the sessions it was still more emphasized as a method of keeping the public good will.

### The Cooperative Campaign Idea

One of the features of the holding of the convention in California was the endorsement of the California Electrical Cooperative Campaign idea by all who had the opportunity of seeing its working and the results accomplished. The extension of this idea to national application was the gist of the report by the Committee on Cooperation in the Industry of which Lee H. Newbert, newly elected president of the Pacific Coast Section, is chairman, and Robert Sibley, editor of the Journal of Electricity, vice-chairman. The recommendation received the hearty endorsement of central station officials, manufacturers and jobbers alike. One of the important discussions of this paper in the brief time which was available, was the official endorsement of the cooperative campaign idea by the executive committee of the Electrical Supply Jobbers' Association, following the presentation of the plan at the Del Monte convention. They recommended the national application of the idea and urged that the two further branches of the selling of electrical securities and the improvement of public relationships to an even greater degree be added to the functions of the campaign. The jobbers offered their services on a joint committee which should consider the wide distribution of utility securities.

### Public Policy Report

A large gathering of members and guests attended the open public policy meeting of Thursday evening at which John A. Britton, chairman of this committee, outlined a program of attainment for the coming year in one of the most inspiring addresses of convention. The review of relationships within the industry and between the industry and the public which it serves with a mark set for future achievement is one of the chief purposes of this yearly gathering, and the remarkable report of the Public Policy Committee formulated a vision of possibilities whose results will be seen in the practical attainments of the next twelvemonth. Among other recommendations, the committee urged the bringing of municipally owned utilities under the same regulation as privately owned and commended the Journal of Electricity for its questionnaire sent out to utility commissions the country over and for its campaign along these lines.

### Technical and Commercial Sessions

The section meetings, which were in large measure the working meetings of convention, concerned



One of the interesting events at Convention was a fine industrial lighting demonstration, especially planned by the Industrial Lighting Division of the N. E. L. A. Lighting Sales Bureau, and given in connection with the Division's report at the Commercial Section session.

themselves in great part with Western problems and discussions of unusual interest developed. Some of the more important questions brought out at these meetings will be considered at greater length at a later time in Journal of Electricity columns.

### New Geographic Sections

Two new geographic sections were formed during the convention period, one the Southwest Division which covers the states of Texas, Oklahoma, Arkansas, Louisiana and Mississippi, and the Rocky Mountain Section, covering New Mexico, Colorado and Wyoming. A. Hargrave, vice-president Subsidiaries of the American Public Service Company, Dallas, Texas, was elected temporary chairman of the Southwest Division; while E. A. Phinney, president of the Jefferson County Power and Light Company of Golden, Colorado, was chosen chairman of the Rocky Mountain Geographic Division. The Southwesterners are urging Hot Springs, Arkansas, as the convention city for next year.



### New Officers

Martin J. Insull, president of the Middle West Utilities Company, Chicago, was chosen president to head the association for the coming year. The following officers were elected to support Mr. Insull in his work:

First Vice-President—M. R. Bump, H. L. Doherty and Company, New York.

Second Vice-President—Frank W. Smith, United Electric Light and Power Company, New York.

Third Vice-President—Walter H. Johnson, Philadelphia Electric Company, Philadelphia.

Fourth Vice-President—Franklin T. Griffith, Portland Railway Light and Power Company, Portland, Ore.

Treasurer—H. C. Abell, American Light and Traction Company, New York.

Executive Committee—R. H. Ballard, E. W. Rice, Paul Spencer, W. H. Atkins, E. M. Herr, Walter Neumiller, D. H. McDougall, E. W. Lloyd, W. A. Layman, J. R. Owens.

The new president emphasized the advancement of public relationships as well as cooperation within the industry as the program particularly to be carried out during the next year.

### The Journal of Electricity Commended

Among the resolutions passed at the concluding session of the Pasadena convention was one introduced by Arthur Williams, general manager of the

New York Edison Company, thanking the McGraw-Hill Company for its contribution to convention in the form of the Convention Daily. Appreciation was expressed to the Journal of Electricity in particular for "its able and helpful cooperation with the Association and the great assistance offered to the Committee on Water Power and their hearty cooperation in the preparation of this report, the map and the compilation of Western data here presented."

### ENTERTAINMENT FEATURES

Under the able management of W. L. Frost, chairman of the entertainment committee, a most elaborate program of entertainment was offered members and guests. Automobiles were available for sight-seeing trips on all occasions and many special features were arranged, such as the impressive performance of the Mission Play given Wednesday evening and the charming tea at the residence of Mr. and Mrs. John B. Miller on Thursday afternoon. The president's reception of Tuesday night, with its spectacular illumination and outdoor dancing, was a glittering success in spite of a slight fog which served only to enhance the beauty of the electrical effects. The cabaret dinner and big night of Friday were in the hands of the Pacific Coast Section, who throughout served as hosts in making Eastern visitors feel the true hospitality of the West. No possible courtesy, such as the providing of morning papers as well as gifts of fruit and bonbons for the lady guests, was overlooked, and unquestionably the attention given these pleasant details did much to make the Pasadena convention the success which it was felt to be by all.

## Electrical Supply Jobbers Del Monte Convention

(The four days of the 1920 Convention of the National Electrical Supply Jobbers' Association which was held at Del Monte from the 11th to the 14th of May were filled with business inspiration and good times. A report of the discussions, lectures and reports of the regular sessions is given below along with the results of the various tournaments.—The Editor.)

When Vizcaino sailed into Monterey Bay in 1602, little did he think that some three hundred and eighteen years later men of the electrical supply jobbing business from all over the United States would assemble there to discuss the best methods for handling a business that this year promises to reach the billion-dollar mark. With the beautiful grounds of the Del Monte Hotel calling to the devotees of golf, tennis, swimming and all of the other out-of-door sports it is small wonder that the five days of the convention were made use of for both business and pleasure, and that in the evenings there were attractions such as the '49 camp to help take the mind of the busy jobber off of the trials of the day.

Outside of the regular business sessions the most important transactions were the golf tournaments, and the meeting on Friday morning when the California Cooperative Campaign was explained to

the Eastern jobbers so as to show them the direct benefit that the jobbers as well as the rest of the industry derived from such a movement.

### First Session

The convention was called to order at eight-thirty p.m., May eleventh, by Albert Elliot, secretary of the Pacific Division of the association. Mr. Elliot proceeded to introduce Robert Sibley, editor of the Journal of Electricity and Pacific Coast editor of Electrical World and Electrical Merchandising, who gave an illustrated lecture on "The Present Status of the Electrical Industry in the West and Its Future Possibilities." Mr. Sibley showed, by a series of charts and diagrams, that in the West today the electrical industry is more extensively developed than in any other part of the world. He showed, by referring to April, 1920, statistics of the United States



CONVENTION OF THE ELECTRICAL SUPPLY JOBBERS' ASSOCIATION



Geologic Survey, that the per capita use of hydro-electric power in the West is over six times that of the United States as a whole.

### Sessions of Geographic Divisions

On Wednesday, May twelfth, there were three separate sessions in the morning, one of each of the



Judging by this picture and the intent attitudes of the people in the left foreground, the '49 Camp at the Jobbers' Convention was the real thing.

geographical divisions of the association, namely, the Atlantic, Central and Pacific divisions. In the meeting of the Atlantic Division, Mr. E. W. Rockafellow, of the Western Electric Company of New York, brought out the fact that sales policies although imperfect and at times narrow, were better than no policies at all, and emphasized the great importance of all jobbing companies having sales policies of some nature, for it is by such policies alone that constructive work in organization can be built up. "The question of a plan," he said, "is of vital importance to the jobbing business, as a sales plan enables the jobber to work out rational ideas on the basis of a low margin in profits."

In the meeting of the Central Division Mr. C. W. Banta, of the Wells-Fargo Nevada National Bank of San Francisco, brought out the fact that cooperation in the industry, particularly in the case of the contractor-dealer, has a direct effect upon the banking credit of the house and that this has been found especially true where broad cooperative policies have been instituted.

The meeting of the Pacific Division was taken up with a discussion of the question involving price fixing and particularly the boundary line beyond which the organization should cease to discuss the question of price fixing. Judge Thomas M. Debevoise, counsel of the association, brought out the fact that to restrain one's own trade is illegal, while to restrain the other man's trade is not only illegal but unfair and immoral.

### Business Session

Thursday morning was given over to the business detail of the Jobbers' Association and to the report of the Society for Electrical Development. Mr. J. M. Wakeman pointed out the vital part the society is playing in furnishing to the magazines throughout the United States non-technical data relating to the industry. He also stated that advertising inserts and inquiries regarding things electrical were handled through his office and went on to ask for more substantial moral and financial support from the jobbers.

### Goodwin Lecture

On Thursday night W. L. Goodwin of the General Electric Company gave a lecture, emphasizing particularly the fact that in such organizations as the N. E. L. A. and the E. S. J. A., "function" proves to be the thing of greatest importance to the organization. "Organizations must give greater attention to more clearly define their functions," he said, "and they must adhere to this policy."

Mr. Goodwin said further that the California Cooperative Campaign was the most constructive piece of work ever accomplished in the electrical industry. Speaking of the problems confronting the industry today, he said that the most urgent was that of financing public utilities, and went on to urge the jobbers and contractor-dealers to invest in public utility securities, thus setting an example to the general public.

### California Electrical Cooperative Campaign

The meeting on Friday morning, May 14, was given over to the discussion of the California Cooperative Campaign. Mr. L. H. Newbert, chairman of the Advisory Committee, opened up the discussion by setting forth the vital facts that have led the central stations throughout California to encourage this movement. Mr. D. E. Harris, vice-president and sales manager of the Pacific States Electric Com-



ION, HOTEL DEL MONTE, DEL MONTE, CALIFORNIA



pany, then proceeded to show how the jobber has benefited through the campaign. He produced striking charts and statistics to show where sales agents and sales campaigns, instituted by the California Co-operative Campaign, have brought large increases in business. He then read a telegram from John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company and the noted dean of the electrical industry in the West.



A motley group at the Jobbers' '49 Camp. We think we recognize some of them in spite of the make-up, but we are not taking chances, and will let you pick them out for yourself.

Samuel H. Taylor,  
Hotel Del Monte,  
Del Monte, California.

Please express my regrets to Convention at inability to attend. You may be assured that nothing but urgent business necessities here prevented. Emory Wishon desires also to have me convey his regrets due to matters of importance occurring in Fresno. State to the Convention that as I view the situation with respect to the cooperation of central stations that the success of central stations in this state has been particularly strengthened by the cooperation of the manufacturers, jobbers and dealers. It is in fact a mutual arrangement that means a measure of success to both. So far as dealers are concerned central stations should in my judgment trust them implicitly in distribution of electric appliances under the cooperative plan. That should be the agency by which the energy is sold and I am hopeful that the present splendid arrangement in California will continue for many years to come to the advantage of all, and in this particular the slogan of the three guardsmen is especially applicable: "All for one and one for all."

JOHN A. BRITTON.

Clyde L. Chamblin, president of the California State Association of Electrical Contractors and Deal-

ers, then gave the contractor-dealer's point of view and showed how the cooperative campaign has helped in the merchandising of their goods and has made four hundred boosters for the central stations. R. M. Alvord, of the General Electric Company, San Francisco, and a member of the Advisory Committee of the Campaign, closed the session by telling how one should proceed to institute a cooperative campaign in a new territory similar to California, putting particular emphasis on the necessity of securing competent leaders for the movement. "The best way," said Mr. Alvord, "is to get together a number of prominent men of all branches of the industry and from them pick a small committee which will be satisfactory to all."

Prior to the close of the meeting a resolution was passed commending the work of W. L. Goodwin, and a resolution commending W. M. Deming, Pacific Coast manager of the McGraw-Hill Company and the Electrical Trio, for the effective work done in making the convention a success.

#### TOURNAMENT RESULTS

##### Tennis

##### Men's Tennis Tournament:

First prize—Winner, Gervais Hillis, Electric Appliance Company, San Francisco.

Second prize—Runner-up, Guy P. Norton, Duplex Light Works of the General Electric Company.

##### Women's Tennis Tournament:

First prize—Winner, Mrs. H. N. Gordon, Harvey Hubbell, Inc.

Second prize—Runner-up, Miss Betty Bibbins, San Francisco.

##### Golf

##### Kickers Handicap Medal Play:

First prize—Winner, H. E. Sherman, Illinois Electric Company, Los Angeles.

Second prize—Runner-up, C. B. Hawley, Intermountain Electric Company, Salt Lake City.

Third prize—Player turning in the low gross score—W. E. Robertson, Robertson-Cataract Company, Buffalo, N. Y.

##### Women's Putting Contest:

First prize—Winner, Mrs. Clarence Wheeler, Wheeler Green Electric Company.

Second prize—Runner-up, Mrs. W. J. Grady, Faries Manufacturing Company, Decatur, Illinois.

Third prize—Best tie score, tie between: Mrs. Herstein, Electric Supply Company, Memphis, Tenn.; Mrs. J. O. Morris, Electric Supply and Equipment Company, Hartford, Conn.; and Mrs. F. S. Price, Pettigell-Andrews Company, Boston, Mass.

##### Tournament Medal Play:

First trophy—H. C. Lucas, Philadelphia Electrical Appliance Company, Philadelphia, Pa.

Second trophy—E. N. Hurley, Hurley Machine Company, Chicago, Ill.

Third trophy—Mrs. Clarence Wheeler, Wheeler Green Electric Company, Rochester, N. Y.

National Metal Molding Company trophy—J. I. Colwell, Western Electric Company, Seattle, Wash.

Turner trophy—H. L. Garbutt, Westinghouse Electric & Manufacturing Company, San Francisco.

Deming trophy—C. E. Listenwalter, Listenwalter & Gough, Los Angeles.

The "Old Copper Cup"—C. E. Listenwalter, Listenwalter & Gough, Los Angeles.



H. B. Kirkland, of the Sprague Electric Works, and F. E. Blake, Hawaiian Electric Company, Ltd.



J. O. Wetherbie, General Electric Company, seems to have mislaid his horse.



H. Q. Foreman, Sibley-Pittman Electric Company, trying to remember where he left his coat when he started.



W. M. Stearns, special representative, General Electric Company, taking a constitutional.



W. H. Colman, General Electric Company, Chicago, wishes the player ahead would get out of his way.



F. H. Gale and H. R. Sargent, of the General Electric Company, having a friendly argument.



# Pacific Coast Section National Electric Light Association

(The records of another important year in Pacific Coast history have been closed by the recent Pacific Coast Section N. E. L. A. Convention in Pasadena. Western problems were of necessity more or less in the background at the national meetings, but a tremendous amount of valuable discussion was crowded into the one day's session which served for the Western Section. A complete abstract of business transacted is here given.—The Editor.)

## General Session—Opening Session

The Pacific Coast Section of the National Electric Light Association was called to order at 9:25 a.m. May 17th, by Robert Sibley, editor of the Journal of Electricity and Pacific Coast editor of the Electrical World and Electrical Merchandising, acting as chairman of the Convention Committee, Pacific Coast Section, N. E. L. A. Mr. Sibley introduced President A. Emory Wishon.

In Mr. Wishon's address he spoke of the spirit of the Pacific Coast Section, and laid emphasis on the

ments and possibilities of the development of the electrical industry in California.

In closing Mr. Wishon recommended certain changes in the by-laws of the association, as follows:

First—That the annual meeting be called prior to the first of July.

Second—That the fiscal year be changed from January to January, to July to July. Under this system each president would be responsible for the financial condition of the Section during his term of office.

Third—That the membership be extended to include members of municipal plants.

Fourth—That representatives of all branches of the industry be appointed on all committees.

Fifth—That the right to vote be extended to members of all classes.

## Secretary's Report

The report of Secretary A. H. Halloran, of the McGraw-Hill Book Company, reviewed the preceding year as a most successful one in the section's history. Mr. Halloran stated that the section started in the fiscal year with a balance of less than \$100.00 and closed with a surplus of over \$4,000.00, and that the membership has increased from 676 in 1919 to over 2000 members at the present time. The largest increase in this membership was in Classes D and E.

Mr. Halloran went on to say, "The outstanding feature of the Section's accomplishments during the past year has been President Emory Wishon's campaign to sell the idea of self-interest. His efforts have not only created many new converts to public utility securities, but have established more freely the public relations toward the power companies."

Mr. Halloran closed by stating that on account of the demands of his new position, he would be unable to accept reappointment to his office.

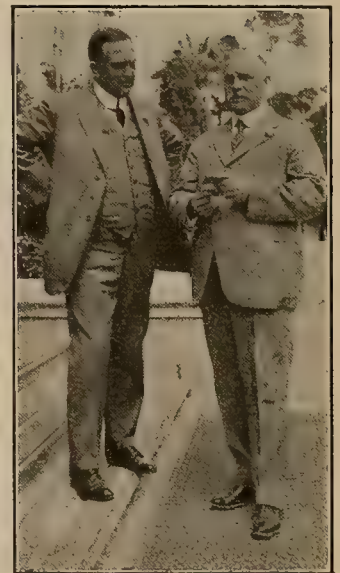
The report of the Committee on Cooperation was not given, as Chairman T. E. Bibbins was unable to be present.



Geo. A. Hughes, president of the Edison Electric Appliance Company of Chicago, Franklin T. Griffith, president of the Portland Railway Light and Power Company and A. E. Wishon, assistant general manager of the San Joaquin Light & Power Corporation and retiring president of the Pacific Coast Section, N. E. L. A., enjoying the hotel veranda.

fact that this Section was responsible to the National Association for its entertainment at this Western convention. Mr. Wishon brought out the fact that it was up to the Pacific Coast Section to tell the men from the East what the geographic section out here has done. He reviewed briefly the formation of the Pacific Coast Section, stating that the men of the Pacific Coast felt the need of a local body to get action and results. The wonderful success of the California Electrical Cooperative Campaign has invaded the East and the success of this and of the Pacific Coast Section has been a national incentive and example as to what can be done along these lines. "The problems of the industry are the common problems of all branches of the industry," he said, "and one of the reasons for the success of the California Electrical Cooperative Campaign and the Pacific Coast Section is the fact that the jobber and manufacturer, the contractor-dealer, and the central station men, have placed all of their cards upon the table."

Mr. Wishon made a plea to the men of the Pacific Coast Section to sell the California idea to the men of the East and make them understand the require-



Two better merchandising movements were represented at convention—Dave Harris and Lee H. Newbert, both of the Advisory Committee of the California Electrical Cooperative Campaign, are on the left, while J. M. Wakeman, general manager of the Society for Electrical Development, is talking with Charles H. Woolley of the Sunset Magazine (on the steps) on the right.





DELEGATES AND GUESTS AT THE PACIFIC COAST SECTION N. E. L. A. CONVENTION

### Report of Publicity Committee

I. W. Alexander, publicity manager of the San Joaquin Light & Power Corporation, made the report for the Publicity Committee, stating that the committee had been organized along the lines of the co-operative idea, and that while the press service bulletin had been started, lack of funds had forced them to discontinue it. He recommended that the next committee carry this on, as it was considered an excellent plan, and that other geographic sections be kept in touch with what California was doing, as he believed that this would do more than anything else to keep the Pacific Coast Section before the eyes of the rest of the industry.

### Committee Appointments

Following committees were appointed by Mr. Wishon:

**Committee for the Change of the Constitution**—L. H. Newbert, commercial manager, Pacific Gas & Electric Company, San Francisco, chairman; A. B. West, general manager, Southern Sierras Power Company; A. W. Childs, superintendent of sales, Southern California Edison Company.

**Nominating Committee**—S. M. Kennedy, vice-president, Southern California Edison Company, chairman; Samuel Kahn, president, Western States Gas & Electric Company; D. E. Harris, vice-president and sales manager, Pacific States Electric Company; Ralph Clapp, manufacturers' agent, Los Angeles; Robert Sibley, editor Journal of Electricity, Pacific Coast editor of Electrical World and Electrical Merchandising.

**Committee on Resolutions**—Henry Bostwick, Pacific Gas & Electric Company, chairman; A. B. Day, Los Angeles Gas & Electric Company.

Before the close of the meeting Mr. R. H. Ballard, president of the National Electric Light Association and general manager of the Southern California Edison Company, said that he had two statements to make:

First, that he wished to congratulate the Pacific Coast Section on the termination of an extremely successful year, and urged the members to adopt the changes in the constitution as recommended by A. E. Wishon.

Second, that the Pacific Coast Section members must bear in mind that they were the hosts of the men from the East and put up with the inconvenience of living so far away from the convention hotel. That the Pacific Coast members must be ready at all times to assist the members from the East in every way possible, and that this assistance should be active and not passive.

During the meeting Mr. Ballard took occasion to speak of the excellent work done during the past year by H. N. Sessions as chairman of the member-

ship committee, in increasing the membership during his term of office from 676 to well over two thousand. Mr. Ballard said that Mr. Sessions was not present to give his report because at that time he was in the lobby of the hotel rounding up some more new members.

### GENERAL SESSION—AFTERNOON

#### Fuel Oil Production

The discussion of the fuel prices proved that this was one of the most vital problems before the industry in the West. According to J. E. Woodbridge and John A. Britton, the industry is now facing a crisis in the matter of fuel oil production and it may shortly occur that many of the present uses of fuel oil will be seriously curtailed in order that sufficient fuel may be available for general power production. It was shown that the price of fuel oil in California has increased perhaps more than that of any other commodity, as from 1915 to date the price of fuel oil has increased from 80 to 218% and all fuels and lighting in the United States from 100 to 190%.

In California the remedy is to develop, as rapidly as possible, the water powers now going to waste so that the railroads now consuming valuable fuel oil may be supplied with electric power and other electrical producing plants consuming fuel oil may be relieved. It was noted by Mr. Woodbridge that in California 40 per cent of the oil producing companies owned 20 per cent of the wells, but produced only five per cent of the oil. This shows that a large number of the California wells produce such small quantities of oil that it is an economic impossibility to drill other wells at the present high cost of supplies, and that no relief may be looked for through increased production.

Robert Sibley, of the Journal of Electricity, stated that already steps are being taken in the various parts of the West to decrease the consumption of fuel oil through replacing it with other fuels such as pulverized coal and hogged fuel.

#### Rating of Motors

In discussing the paper, "Central Stations and the Rating of Motors," by John Hood of the General Electric Company, San Francisco, Carl E. Johnson of Los Angeles said: "In the brief time allotted to me for discussion of Mr. Hood's paper, I shall attempt





GROUPED ON THE LAWN OF THE HOTEL HUNTINGTON, PASADENA

to hit only the high spots and point out a few additional facts, confining my remarks particularly to polyphase motors of smaller than 75 horsepower.

"A careful analysis of all phases of the 40 and 50 degree motor question seems to point out that the little skepticism with which the continuous rated motor meets is largely without foundation. This is probably for the reason that they are comparatively new and that so very little seems to be known about just what the designing engineers and manufacturers have, up to this time, given us.

"The accompanying table gives a compilation of interesting data that has been taken from actual test records and performance guarantees of representative makes of standard motors of different horsepower ratings, speeds, etc., that will serve as a basis of comparison of the 40 degree and the new 50 degree motors as we actually know them today.

"The data given is typical and representative of both lines of modern standard motors now on the market between the sizes of 1 to 75 hp., and will bear out the fact that the 50 degree motor is very much better than is generally believed and will also prove that the designing engineer and the manufacturer have really put and built something more into the 50 degree motor than merely giving it another name.

"The progress of the electrical art is a matter of common knowledge and no engineer will deny that motor design and construction should come in for its share of development. Is it not logical, then, that the design of motors as new as the so-called 50 degree motors should incorporate all that has been learned since even the latest type of 40 degree motors were designed? I believe most engineers will agree that in very recent years much has been learned of motor design and construction, particularly of the feature of efficient and thorough motor ventilation, the advantages of which 50 degree motor designers undoubtedly have availed themselves of to a greater extent than heretofore.

"When you stop to think that these wonderful results have been obtained with the use of less material, it must surely be conceded remarkable and is indeed a credit to the motor manufacturer making their introduction worthy of the heartiest cooperation of all interested in motors.

"It has been shown that only about 10 per cent of all 40 degree motors are overloaded. If this is true, why should the other 90 per cent of all other motor users be penalized and made to pay more just to accommodate the 10 per cent that are overloaded? At the prices prevailing today 40 degree motors, as nearly as can be averaged, cost approximately 12 per cent more than the corresponding 50 degree, so that it is evident that the premium in providing for the occasional overload, which exists in about 10 per cent of installations made, is very heavy indeed. Furthermore, this does not take into consideration the increased cost to provide proper transformer capacity and the increased cost of installation and operation of the 40 degree motors."

The speaker said that for the consumer the 50 degree motor will mean better all-around efficiency for less money and less cost to install and maintain; that it would mean a better power factor, with less transformer capacities, wiring auxiliaries, accessories, etc., required, with resulting less cost for the central station; and that to the contractor-dealer and machinery dealer who sell motors is bound to come additional business through increased number of installations and sales, because of the increased popularity of individual motor drives resulting from lower first cost of motor and installation and lower cost to operate.

He further stated: "The motor manufacturer has spent much money and thought on his problems of design and production and gives you today a highly efficient and standardized product, into which is incorporated many features that lessen both the central station, contractor-dealer and motor users' trouble, such as indestructible rotors and other improvements, but he is not yet fully satisfied, and he is still on the job trying to attain something better."

Mr. C. E. Ingalls of the Crocker-Wheeler Company, San Francisco, next took up the discussion of Mr. Hood's paper, and taking the opposite side, said:

"The advocates of the 50 degree rating claim that our knowledge has increased to such a degree that it is now possible to make an exact motor selection; others claim that such exactness is impossible, and that a factor of safety is required. Exact predetermination of a load is usually impossible, due to lack of sufficient accurate data so that careful engineering would demand a factor of safety. Even if the



COMPARATIVE PERFORMANCE TABLE OF REPRESENTATIVE 50 AND 40 DEGREE STANDARD POLYPHASE SQUIRREL CAGE INDUCTION MOTORS BETWEEN 1 AND 75 H. P.

Motor No.	EFFICIENCY								POWER FACTOR							
	½ Load		¾ Load		Full Load		1½ Load		½ Load		¾ Load		Full Load		1½ Load	
	50°	40°	50°	40°	50°	40°	50°	40°	50°	40°	50°	40°	50°	40°	50°	40°
I	85.0		86.0		85.0				71.5		82.0		86.5			
II		83.5		85.5		85.5		83.5		64.5		76.5		83.5		88.5
III	87.0		88.0		87.0				74.0		84.0		88.0			
IV		87.0		86.5		86.0		82.5		76.0		86.0		89.5		91.0
V	88.5		89.5		88.5				76.5		85.0		89.0			
VI		86.5		88.5		87.5		86.5		82.5		88.5		91.5		92.5
VII	91.0		91.5		90.5				85.0		90.5		92.0			
VIII		87.5		89.5		89.5		88.5		82.5		88.5		91.5		92.5
IX	89.5		90.5		89.5				75.5		84.5		87.5			
X		88.5		89.5		89.5		88.5		70.5		81.5		86.5		88.5
XI	89.5		90.5		90.0				88.5		92.5		93.5			
XII		91.0		92.5		92.5		91.5		82.0		89.5		92.5		93.5
Averages	88.4	87.3	89.3	88.7	88.4	88.4		86.8	78.5	76.3	86.4	85.1	89.4	89.2		91.1
*Differences	+1.1		+.6		0				+2.2		+1.3		+.2			

\*A positive result is in favor of the 50° Motor. Average full load temperature rise of the above 50° Motors is 33.2° centigrade—minimum 26° and maximum 40°.

load could be exactly predetermined there is no guarantee that this load would not change.

"The acid test is whether 50 degree motors can be applied safely. The verdict regarding dependability rests with the motor user, and careful investigation has shown that this verdict is being given by an ever increasing number of motor users who insist on 40 degree motors—who say they are finding that they require 40 degree motors with a reasonable margin of safety to insure continuous untroubled operation."

In closing the discussion, Mr. Hood said that the objections quoted by Mr. Ingalls were the same as had always been presented, and that the engineer must decide between the two viewpoints for himself.

### Railway Electrification

The next paper to be discussed at the general session in the afternoon was "The Commercial Aspect of Railway electrification," by E. B. Criddle, W. L. Frost, and G. B. Kirker.

Mr. Criddle started the discussion of the paper by briefly sizing up its salient features and then turned the paper over to Mr. Kirker of the Westinghouse Company for further discussion. Mr. Kirker said:

"The railroads of the country which have electrified their lines, have demonstrated that electric motive power is superior to steam. With the ever increasing cost of fuel, along with the necessity of hauling heavier trains, a great many of the roads are considering electrification. This is especially true of the railroads on the Pacific Coast.

"One feature which retards electrification is the first cost, another will be the development of the necessary power, unless the proper legislation is enacted, to assist instead of retard the development of the water power. If the railroads can purchase cheap power, one of the big items of first cost is eliminated."

In concluding his discussion, Mr. Kirker stated:

"The central station which furnishes the power for the railroad would in a reasonable length of time be furnishing electric power to the towns, mines, saw-mills, pumping plants, and the various industries in all the region tributary to the railroad. Such an arrangement would develop the territory. The central station, in finding an outlet for its power, would increase the industries and this would increase the business of the railroads. As both the railroads and the central stations are public utilities, each should remain in its own special line, one furnishing transportation, the other furnishing power, and unite in the endeavor to increase the commercial wealth of the country."

Mr. R. W. Clark of the Puget Sound Power & Light Company was the next to take up the discus-

sion. He spoke of the particular instance of the electrification of the Chicago, Milwaukee & St. Paul Railroad. Mr. Clark stated that from the central station point of view, electrification is desirable for three reasons:

"First—It brings about the interconnection of different power companies.

"Second—The railroad load is desirable as it raises the load factor.

"Third—The electrification of a railroad demonstrates the wonders of electricity to the public and makes for friendly relations with same. The diversity of the railway load has distinct advantages, and in the Northwest has brought about a large increase in the number of consumers."

The paper by R. E. Fisher of the Pacific Gas & Electric Company was read by the secretary, as Mr. Fisher was not present. In his paper Mr. Fisher quoted from the report of Samuel Insull, president of the Commonwealth Edison Company of Chicago, bringing out the point that the railroads in the last few years have had a great deal of trouble in raising the necessary capital to take care of their expanding business, and that they have had to pay relatively high prices for it. The question of the electrification of their local terminals and trunk lines is a question which involves two things: First, the successful conversion of the existing equipment; second, the raising of the capital to do the work.

The opportunity of the central station, according to Mr. Insull, is simply to stand ready to sell energy to them when they want to buy it from us.

Mr. Fisher went on to point out that, in his opinion, one of the first essentials would be the fixing of a definite kilowatt-hour cost to be paid by the railroad, and second, the possible amount of power which could be set aside for railway electrification at some period in the future.

Mr. Fisher closed by saying:

"I wish again to reiterate that the mission of the central stations in this most important matter is to so program the entire problem that it will automatically create a demand, and will bring such an influence to bear on the Federal Government that the present restrictions on hydroelectric development may be withdrawn and the entire matter encouraged from the viewpoint of conservation and general national economy."



### Cooperation with the Architect

The next paper to be discussed was that written by Garnett Young, general manager of the Garnett Young Company of San Francisco, on "How the Electrical Industry Can Cooperate with the Architect and Builder." In the absence of Mr. Young, K. E. Van Kuran read a summarization of the paper which had been written by Mr. Young. The point was brought out that the paper had been written in such language as to make it readable by and acceptable to the professions that the industry is trying to interest.

"To this end, a number of paragraphs of the paper were devoted to establishing for the benefit of the architect and builder a complete alibi as to past sins of omission which have resulted in the present deplorable insufficiency of wiring homes.

"The article places the blame on the industry for having spread the doctrine of attaching to a socket everything from an incandescent lamp to a washing machine, thus misleading the public into a belief that the socket answers for every connection just as a switchboard does for current control. This is wrong, particularly, from the viewpoint of service affecting the consumer's ultimate interest and an argument is made that the problem should be solved by the employment of flush wall receptacles on the scale of an outlet for every appliance."

The first person to discuss the paper was Lee H. Newbert, chairman of the Advisory Committee of the California Electrical Cooperative Campaign, who said there was only one side to the question with no room for argument, and that the paper must be considered of great value to both the industry and the public.

John A. Britton, of the Pacific Gas & Electric Company, said that in his opinion more stress should have been placed upon the selling of the idea to the architect, as the contractor and builder would hesitate to make extravagant suggestions in the wiring of the home for fear of losing the job, whereas the person who was building the home would usually accept the architect's advice.

Mr. Britton closed by saying that the success of the convention should not be measured by the papers presented, but by the number of ideas that were carried home from it and put into actual practice.

Mr. Clyde Chamblin, president of the California State Association of Electrical Contractors and Dealers, took up the discussion by stating what it meant to the contractor-dealer to have all homes completely wired. Mr. Chamblin went on to point out that, in his opinion, the contractor-dealer should not let dollars and cents usurp leadership of the policy of "service to the public" and the "uplift of humanity." He pointed out the possibility of the electrical contractor making the home a real home in every sense of the word instead of a place to eat and sleep, and referring to the home, spoke of it as the greatest central station in the world. He said further that the work of electrifying the home must be carried out by appealing to the woman.

Mr. H. L. Harper, manager of the Western Electric Company of Los Angeles, then took up the discussion, and stated that the job ahead was two-fold:

"First—Should we not immediately through cooperative effort take our message direct to the public so that they will demand of their architects, building contractors, building investors and contractor-dealers a suitable installation?"

"Second—Should we not through cooperative effort take our message directly to the public through the architects, building contractors and building investors?"

In closing, Mr. Harper made the following statement, which brought out the viewpoint of the jobber regarding Mr. Young's paper:

"What better evidence is needed that 'convenience outlets' form the 'neck of the bottle' than the data compiled by the Society for Electrical Development, which shows that where convenience outlets are installed 97% of the labor-saving appliances are being used daily and performing the service for which they were purchased, while in homes not properly wired only 60% are in use, the balance being 'on the shelf' or 'entirely discarded'?"

"Unless this problem is met along some such lines as suggested by Mr. Young, we are all going to suffer and our possibilities for a bigger and more profitable business will be curtailed—so, as jobbers, we heartily endorse the plan and offer our support to bring about the result desired."

R. M. Alvord of the General Electric Company of San Francisco then finished the discussion of Mr. Young's paper by stating that it has been an incentive to the California Electrical Cooperative Campaign to start something along these lines. Mr. Alvord put a great deal of stress upon the fact that while we are wiring homes today in the manner we believe to be adequate, we must not forget to look to the future, and the great number of new appliances that will surely come. He spoke of the electrical homes being built in San Francisco, Oakland, Sacramento, and Los Angeles, and plans for building other similar homes throughout the state.

### California Cooperative Campaign

A report of the California Electrical Cooperative Campaign Committee was made by Lee H. Newbert, chairman of the executive committee of the Campaign. He briefly sketched the history of the Campaign and the various activities it has engaged in in bringing the electrical industry to a higher plane.

Included in this was the work of the field representatives and the wiring expert; the building of model electrical homes, and wiring diagrams of houses with adequate outlets; the increase in advertising done by contractor dealers, and other work tending to make of the electrical contractor a better business man.

In closing, Mr. Newbert said:

"In conclusion, your committee wishes to express its conviction that the results thus far accomplished have more than justified the effort, and that it is confident of even greater progress in the future. With its organization in working order and its period of trial happily past, the California Electrical Cooperative Campaign should meet with continued success."

### Appliance Solicitors

A. W. Childs, assistant general agent of the Southern California Edison Company, then presented his paper on "The Value of Appliance Solicitors" for discussion, and briefly told of the early efforts to sell electrical appliances, which was made possible only by the house to house solicitor leaving the appliances there for trial. Mr. Childs pointed out that the solicitor was an educational agent, and stated that, in his mind, the field should be worked by the solicitor, not only once, but time and time again.

D. E. Harris, of the Pacific States Electric Company, then took up the discussion, and said that service to the public was absolutely necessary. Otherwise all of the other work was of no use. He pointed



out that Mr. Young's paper and Mr. Childs' paper were very closely allied, and suggested that the contractor-dealer put on enough solicitors so that every home in the state would be visited at least three or four times a year.

Captain Howard W. Angus, secretary of the California Electrical Cooperative Campaign, in discussing electrical advertising, stated that the Campaign had in preparation a bulletin of instruction in advertising. This bulletin was prepared so that it might be used as a manual to be followed by the contractor-dealer, and embraced newspaper advertising, advertising by mail, by letters and booklets. The book also contains valuable suggestions for advertising by signs, bill boards and moving pictures, with a special chapter on store and window displays. This bulletin will probably be ready by the middle of June and will prove of inestimable value to the members of the electrical industry who are not able to carry an advertising man on their staff.

This finished the discussion of papers, and immediately the closing session was started.

### BUSINESS SESSION

The first report to be accepted was that of the Committee on Constitutional Amendments. Lee H. Newbert, chairman, of the Pacific Gas & Electric Company, stated that the committee had acted upon the recommendations of President Wishon, and the following changes were adopted as read:

Article 1, Section 1; Article 1, Section 6; Article 1, Section 8; Article 1, Section 10; Article 1, Section 11; Article 4, Section 7; Article 5, Section 2; Article 6, Section 1; Article 6, Section 2; Article 7, Section 1; Article 8, Section 1; Article 9, Section 1.

Henry Bostwick, of the Pacific Gas & Electric Company, chairman of the Resolutions Committee, presented the following resolutions which were adopted as read:

"Resolved, That the Pacific Coast Section requests the National Electric Light Association in its convention assembled to give full thought and consideration to ways and means of raising the vast sums of money which will be required for the development of the hydroelectric resources of the state of California and other commonwealths of the nation, which will mean so much in conservation of the exhaustible fuels, particularly coal

"And be it further Resolved, That it is the sense of the Pacific Coast Section that such support on the part of the National Association will be necessary to enable the various operating companies of the nation to carry out their several financial programs and to enable them to meet the unprecedented demands being made upon them for additional electrical energy.

"Resolved, That this Association tender to the Journal of Electricity and its editorial staff its hearty commendation for the work that it has done for the industry during the past year, and more particularly for the powerful contribution it has made in connection with the Water Power Committee's report that is to be presented to the National Electric Light Association Convention this week;

"And be it further Resolved, That the Pacific Coast Section is especially indebted to Mr. Robert Sibley for the time and energy which he has devoted to the promotion of its interests.

"Resolved, That the Pacific Coast Section desires at this time to express to the California Electrical Cooperative Campaign Committee its appreciation for the constructive work which it has done and is doing by developing the spirit of cooperative relationship between the various electrical interests, resulting in a far greater use of electrical energy for all purposes.

"And be it further Resolved, That it is the recommendation of the Pacific Coast Section that the work of this committee be continued, and that the Pacific Coast Section pledges this committee its full and unequalled support in the future.

"Resolved, That a vote of thanks be tendered to the outgoing officers of the Pacific Coast Section for the wonderful work which they have done during the past year, as shown by the report read before the convention by Secretary Halloran; and more especially to our president, A. Emory Wishon, for his untiring efforts as well as the time and the study he has given to the self-interest problem of our industry as a whole, and which has now become of nation-wide interest.

"Also be it further Resolved, That all of the recommendations which have been made by President Wishon in his opening remarks receive full thought and consideration at the hands of the officers-elect."

S. M. Kennedy, vice-president of the Southern California Edison Company, made the report of the Nominating Committee, as follows:

President—Lee H. Newbert, Pacific Gas & Electric Company.  
First Vice-President—A. B. West, Southern Sierras Power Company.

Second Vice-President—J. B. Black, Great Western Power Company.

Treasurer—A. E. Morphy, Southern California Edison Company.

Executive Committee—L. H. Newbert, Pacific Gas & Electric Company; A. E. Wishon, San Joaquin Light & Power Corporation; A. B. West, Southern Sierras Power Company; J. B. Black, Great Western Power Company; A. E. Morphy, Southern California Edison Company. Three-at-Large—Geo. A. Campbell, Truckee River General Electric Company, representing Nevada; C. M. Einhart, Roswell General Electric Company, representing New Mexico; R. S. Masson, Arizona Power Company, representing Arizona. Class A—Wm. Baurhyte, Los Angeles Gas & Electric Company; H. H. Jones, San Diego Consolidated Gas & Electric Company. Class B—Wm. Shepard, California-Oregon Power Company; Henry Bostwick, Pacific Gas & Electric Company. Class D—G. E. Arbogast, F. E. Newberry Electric Company; W. M. Deming, McGraw-Hill Company. Class E—D. E. Harris, Pacific States Electric Company; K. E. Van Kuran, Westinghouse Electric & Manufacturing Company.

The nominations were accepted unanimously, and Mr. Kennedy and Mr. Robert Sibley were requested by President Wishon to lead the new president up to the stage, where Mr. Wishon complimented Mr. Newbert and the Pacific Coast Section upon the election of such a man as president.

In accepting the gavel from Mr. Wishon, Mr. Newbert made a plea for the cooperation of the entire membership, without which he said he would be unable to lead the Section through a successful year.

### ENGINEERING SESSION

Mr. P. M. Downing, chairman of the Engineering Committee, read the report of his committee covering the activities during the past year. The principal work performed by the committee was on the subject of insulators and line codes. Under the supervision of Dr. Harris J. Ryan of Stanford University, the work began in former years on insulator investigation has progressed to the point where it now appears that the solution of the insulator problem is in sight. The investigations made by the committee cover a large number of fatigue tests and electrical tests on several hundred sample insulators.

The work of the line code committee and the work on the utilization code has progressed satisfactorily. The latter code is now being finally revised and will, no doubt, be accepted by the Industrial Accident Commission and the Railroad Commission.

In the discussion of the paper on "Relay Protective Systems," by G. E. Armstrong, H. A. Barre of the Southern California Edison Company described at length the progress made by his company in the development of relay protective devices. Of particular interest is the balanced relay protective scheme, which consists of single phase, mechanically balanced current coils, arranged for the opening of the defective line of two parallel lines. Mr. Barre reported that this relay has been put into operation and has proven quite satisfactory.

In the general discussion of this problem, it was considered for the most part that more attention might well be given to this important phase of transmission line operation. J. A. Lighthipe of the Southern California Edison Company, C. O. Poole of the Southern Sierras Power Company, and E. R. Stauffer of the Southern California Edison Company brought out a number of points regarding the peculiarities of the Western transmission systems in connection with short circuit currents that occur during disturbances. On the lines typical of the West, the currents do not reach the magnitude of those experienced where short large capacity lines are connected with turbo generators.



Other methods of relay protection were discussed by J. P. Jollyman, Pacific Gas & Electric Company, and J. E. Woodbridge of Ford, Bacon and Davis, San Francisco. Mr. Woodbridge brought up the proposition of installing a reactance between the neutral of the high tension windings of star connected transformers and ground to take the place of either resistance or a slight ground. The theory of this protection is that the reactance should be so selected as to counteract the capacitance of the transmission line and thereby decrease the current which would flow to ground on the occasion of a short. R. J. C. Wood, Southern California Edison Company, Los Angeles, pointed out that a reactor and a condenser in series might lead to a condition of resonance.

J. P. Jollyman illustrated the application of residual current relays for connection between the current transformers used to supply current to inverse time limit relays in the neutral wire which would cause the operation of switches only when there was current flowing to ground. This form of relay would, therefore, act on all unbalanced currents to earth such as would result only when trouble occurred.

#### Power Factor and Rates

In the discussion of the paper by E. A. Quinn on "Power Factor and Rates," the principal points discussed were the availability of static condensers for use in industrial plant installations. At the time it has been found that static condensers are justified from the cost standpoint between installations from 50 to 300-kva. in 1100 and 2200-volt sizes, as well as 440-volt ratings. J. C. Clark and A. G. Jones of the General Electric Company, San Francisco, spoke of the success which has attended such installations in the past. L. M. Klauber of the San Diego Consolidated Gas and Electric Company, stated that it appeared preferable to determine the average power factor of consumers of different classes and demands, and base the rate upon these rather than to meter each installation and determine the rate in that manner. C. O. Poole of the Southern Sierras Power Company favored this method of rates based on power factor; while others, particularly J. P. Jollyman, Pacific Gas & Electric Company, E. J. Crawford of the San Joaquin Light & Power Corporation, and R. H. Halpenny of the Southern Sierras Power Company, favored the installation of either the static or the synchronous condenser at the load distribution center and the inclusion of charges based on the interest and maintenance expense of the equipment in the consumer's bill. Others, while favoring the use of rates based on power factor, believed that the complexity of the rates and the difficulty of determining from time to time in a fair manner the power factor of installations, rendered the application of power factor rates prohibitive. Among those holding this view are P. M. Downing of the Pacific Gas & Electric Company, and J. A. Koontz of the Great Western Power Company, San Francisco.

C. A. Johnson, of the U. S. Electric Company, Los Angeles, in discussing the design of motor equipment which would operate at higher power factors

than the present induction motors, stated that careful tests indicated that the motors now being marketed on the 50 degree basis operated not only at higher efficiency, but also at a higher power factor than motors formerly rated on the 40 degree basis.

#### COMMERCIAL SECTION

The Commercial Section started promptly at 10 o'clock with K. E. Van Kuran, general manager of the Westinghouse Electric & Manufacturing Company, Los Angeles, presiding.

In presenting his report, Mr. Van Kuran stated:

"Demand in excess of supply is always a delightful situation for the producer, provided it does not get out of hand or proceed for such a length of time as to seriously retard the initiative of the producer, and permanently affect the confidence of the consumer in the reliability of service."

Mr. Van Kuran then proceeded to sum up the existing shortage in the state and the steps that have been taken to remedy the situation, and quoted Mr. H. G. Butler, the power administrator for the Railroad Commission of California, as stating that in view of the proposed interconnections in the state, and the total of 282,250 kilowatts that were to be added to the present supply by the end of 1921, another such dry year would not work such a hardship on companies and consumers.

Mr. Van Kuran summed up the papers that were to be presented for discussion, and in conclusion stated that the committee had found the industry unanimous in praise of the work being done by the California Electrical Cooperative Campaign under the direction of their advisory committee and their field representatives.

The Commercial Committee recommended to the Executive Committee of the Pacific Coast Section the official endorsement of the plan being worked out by the Advisory Committee of the California Electrical Cooperative Campaign to form, under the direction of the Advisory Committee, their field men and their salesmen's auxiliary, local bond and stock holding clubs. According to the plan, these clubs are to be organized in each office, store, and plant of the manufacturers and the jobbers, and in the local sections of the California State Association of Electrical Contractors and Dealers, for the purpose of supporting the financial plans of their local power companies.

#### Illumination

In opening the discussion of his paper on "The Value of Proper Illumination," H. D. Fagan, of the National Lamp Works of the General Electric Company, San Francisco, dwelt on the importance of the paper to salesmen, contractor-dealers, jobbers, and in fact all of the industry. He dwelt briefly on the value of proper lighting and window displays, told the meeting to make a broad plea for street lighting, appealing to the civic pride, but most important of all, Mr. Fagan said, was the problem of the lighting of industrial plants.

Hugh Kimball of the Kimball Electric Company of Oakland, in discussing the paper brought out the fact that the value and necessity of proper illumina-

(Continued page 583)



## San Francisco's Electrical Home

(The home of today seems inconvenient when compared to the completely equipped one predicted as the regulation American home of tomorrow. The model electrical home which has been equipped through the efforts of the California Electrical Cooperative Campaign and various San Francisco business houses, will give to the public a glimpse of the convenience and luxury brought about by the use of electricity throughout the entire house, and will also give the public an idea of the service which the electrical industry is rendering in raising the entire nation's standard of living.—The Editor.)

Through the efforts of the California Electrical Cooperative Campaign and various business houses in San Francisco a model electrical home has been built, correctly wired and furnished completely and will be opened for inspection to the public on the 4th of June. This modern eight-room, two story, stucco house was built in St. Francis Wood by Mason-McDuffie Company, Henry H. Gutterson being the architect. Through the efforts of Mr. Walter F. Price, architect of the campaign, Mason-McDuffie agreed to let the campaign furnish the wiring diagram and use the house for a practical demonstration of how completely an average home can be electrically furnished. The furniture, lamps, mirrors, etc., have been furnished by L. Kreiss and Son; the electric piano by Byron Mauzy; the electric victrola by Sherman, Clay and Company; the current has been furnished gratis by the Pacific Gas and Electric Company and the various appliances by the following jobbers: Pacific States Electric Company; Electric Appliance Company; Electric Railway and Manufacturers Supply Company; Electric Manufacturing Company; Western Electric Company; Alexander-Lavenson Company; Electric Supply Company; Dunham, Carrigan and Hayden and The Majestic Electrical Development Company.

The house has 110 outlets and while all of the rooms are fitted with standard electrical appliances, the kitchen and laundry will be the two most interesting rooms in the house. There will be twenty-five different appliances and these will be demonstrated in action under exactly the same conditions as exist in the average household, the advantage of this being that in the demonstrations given in a store the prospective purchaser has no idea just how the appliance will work in the home.

The idea of the demonstration is to show the general public the advisability of sufficient outlets and the extent to which electrical appliances can lighten the household duties of the housewife and solve the servant problem. Following is a list of the appliances and where they will be found.

### KITCHEN

Electrical range  
Utility motor  
Circular water heater  
Dish washer  
Waffle iron  
Percolator

### LAUNDRY

Washing machine  
Ironing machine  
No. 6 Electric Iron  
No. 3 Electric Iron

### BREAKFAST ROOM

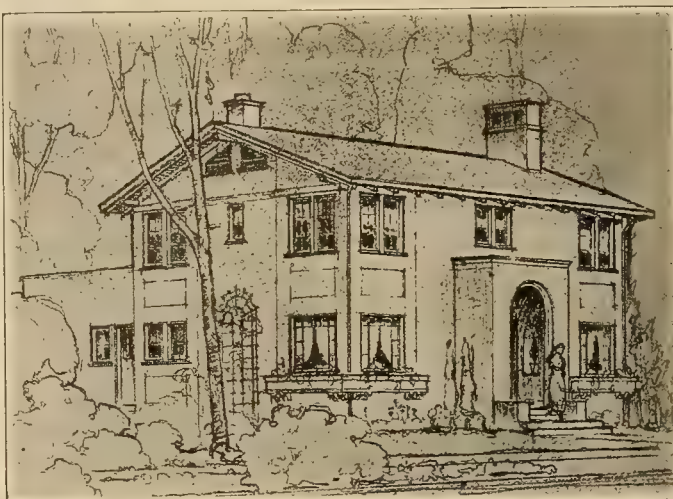
Vacuum cleaner  
Samovar  
Chafing dish  
Portable heater  
Combination grill  
Toaster  
Percolator

### BATH ROOM

Electrical vibrator  
Electrical curling irons  
Electrical shaving cup  
Portable heater  
Electrical hair dryer

### BED ROOMS

Electrical sewing machine  
Vacuum cleaner (for up-stairs cleaning)  
Hot water cup  
Heating pads  
Portable heater  
Wall type air heater



This beautiful two-story house in St. Francis Wood, San Francisco, is the most completely wired and electrically furnished home in the city. The wiring plans were furnished by the California Electrical Cooperative Campaign and the San Francisco jobbers have loaned the equipment that is being demonstrated in the house. Considerable advertising has been given to this remarkable plan to show the public the benefits to be derived from the use of electricity and the number of ways in which it can be used so as to completely solve the servant problem.

### Illumination

Besides the appliances noted above special attention has been paid to the illumination. The latest type of fixtures have been installed so that all of the rooms are properly lighted and have sufficient convenience outlets for floor lamps and table lamps down stairs and reading and boudoir lamps in the bed rooms.

### Selling the Idea

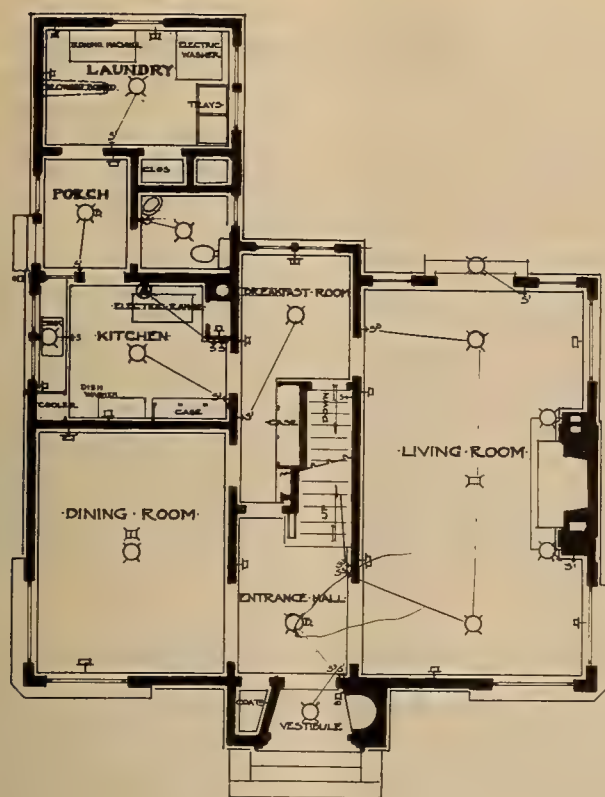
All of the demonstrations will be given with the idea of selling the electrical home idea rather than setting forward the good points of the particular appliance demonstrated. The dem-

onstrators will point out that the appliance in question is only one of a great number of excellent appliances, all of which differ only in minor features and accessories.

This most modern of modern homes can be characterized as 'servantless' and it is, for this reason, especially significant at a time when it is almost impossible for the family of average means to obtain satisfactory domestic help. The men of the electrical industry in San Francisco have put forth every effort to make this a perfect home and believe that it truly represents the greatest efficiency in the utilization of present day appliances.

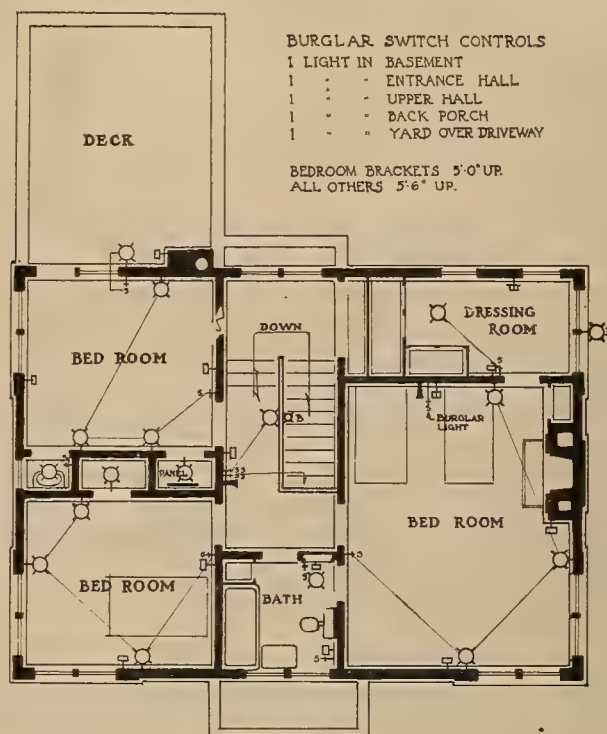
Similar "electrical homes" are being built in Oakland, Sacramento and Los Angeles and plans are being made to have such homes built in Fresno, San Diego, Stockton and other important coast and valley towns where there is sufficient building going on to make the plan feasible.





•FIRST FLOOR PLAN•

First floor plan of the California Electrical Cooperative Campaign's electrical home in St. Francis Wood, San Francisco. The main features of this wiring diagram are the number of convenience outlets in the dining room, living room and breakfast room, and the complete electrical installations in the kitchen and laundry.



SECOND FLOOR PLAN

The plan of the second floor of the electrical home shows the outlets necessary for a completely equipped bed room, boudoir and bath, with the burglar alarm placed where it is most accessible. The number of convenience outlets in the bed room are for the reading lamps, warming pads, night lamps and appliances which will be wanted at the head of the bed during the light.

## Cooperation With Architects and Builders

BY H. F. JACKSON

(The campaign for convenience outlets grows apace. Here is an interesting paper by the vice-president and assistant general manager of the Pacific Gas & Electric Company, delivered before a recent meeting of the San Francisco Electrical Development League, that adds emphasis to the interest that is being manifested on all sides.—The Editor.)

The greatest problem that faces us today is that of having the public understand what the electrical industry is doing for the nation, but in my opinion this understanding can only be brought about by proving to the individual of this public what the electrical industry is doing for him, what further developments in the electrical industry mean to him in dollars and cents gain, and what a delay in electrical development, due to legislative and other causes, means in dollars and cents loss to his individual business. This is practically the self-interest story as expounded by a member of this League, Mr. Emory Wishon.

In order that a proper relation may exist between architects, builders and the electrical industry cooperation in the fullest meaning of the word is essential. The use of electricity in the home has primarily been that of lighting. Good illumination properly applied is no more costly than poor lighting. It is within the reach of the vast majority, but like all good things, money alone will not suffice. Care and study are necessary. Cooperation between architects, decorators and lighting specialists is imperative to insure that proper lighting fixtures shall be available and properly applied. Good lighting

touches our daily life so intimately and has such great possibilities for positive value to us that it deserves more careful consideration than it has received in the past.

### Development of Appliances —

The use of electricity in the home has been greatly increased through the use of appliances until today it would be difficult to find a home that is using electricity for lighting that is not using some sort of an electrical appliance. An idea of the greatly increased demand and use of electric appliances can be gained from the somewhat startling report of the California Electrical Cooperative Campaign for the years 1918-19. Sales from eleven distributors reporting in northern California are given below.

The use of lighting outlets and sockets for the attachment of an electrical appliance should be discouraged if not altogether prohibited. Here is a rich field for cooperation between the architect, builder and home designer. Such use of a socket for the attachment of an appliance is not only unsightly and inconvenient, but it is dangerous. The burden of correcting this objectionable practice must rest with the electrical industry. The properly wired home should be fitted with convenient outlets for



every kind of electrical appliance, so that it is never necessary to unscrew a lamp from a socket in order to use an iron, toaster or heater. If a house were provided with a plug at the time of building the expense would be saved later and the use of electrical appliances would be greatly increased.

It seems perfectly obvious that the proper time to make provision for the most favorable use of appliances is during construction. This is true for a number of reasons. The ultimate cost will be less and the entire layout of the job will be more satisfactory, assuring the desired results. An installation properly designed and laid out during the construction of a building will permit the installation of the proper size wire which will prove economical to the consumer, and will avoid, to a large extent, any unreasonable drop and complaints of low voltage. The safety of the entire installation will be assured, to say nothing of avoiding the unsightliness and disfigurement of the premises that are bound to result when electrical work is installed after construction is completed.

The old saying "Every man to his trade" has considerable merit. We of the electrical industry should never presume to encroach upon the field of the architect, the builder, but cooperative helpfulness with the architect and builder on one hand and the manufacturer, jobber, central station and contractor-dealer on the other is needed. It is a difficult thing for those of us in any particular line of the electrical industry to keep in touch with the developments in other lines of that industry. How much greater must be the difficulty for those outside of the electrical industry to keep in touch with the rapid developments of the industry.

The California Electrical Cooperative Campaign and the San Francisco Electrical Development League are continually fostering cooperation between the electrical industry and members of the building industry. The latter has provided, and is providing an open forum for the discussion of all matters electrical and the former is putting into practice and operation an extensive plan of cooperation and education.

Expert Assistants

One of the most practical attempts on the part of the California Electrical Cooperative Campaign has been the furnishing of an expert to call on architects and builders in order to assist them in the designing of houses, as far as the proper electrical wiring is concerned, in order to accommodate the convenient use of all modern electrical labor saving devices, and to bring to their attention the more recent developments in things electrical for the home. This representative has nothing to sell and does not recommend any particular kind of manufacture of materials or appliances. It is hoped that such experts will be welcomed into the offices of architects and builders in the spirit in which they are sent—that of cooperation and assistance, and it is also hoped that fairness and keen desire to do the square thing will bring about the greater use of electric appliances, increased safety to property and a more economic use of electricity.

REDUCTION OF FIRES IN GENERATING UNITS

The question of adequate protection against fires in generating units was taken up at the recent convention of the Northwest Electric Light and Power Association in Seattle and recommendations made of best methods of handling the difficulty. The occurrence of fires in generating units is by no means new, but of late years the number of such cases has increased, especially in generators of the enclosed type. Due to the time required to bring the machine to a stop, fires of this character have in the past usually caused the complete destruction of the windings of both rotor and stator. A number of plans have been proposed to cope with this danger and a considerable number of installations of permanent equipment have been made in the Northwest with the idea of minimizing the extent of damage from such fires. The installation of balanced protection in each leg of the generator windings, so as to promptly disconnect the machine from the line and open the fields is becoming quite common and gives promise of being very effective as a preventative measure. To facilitate this, it is being urged upon the manufacturers to standardize the bringing out of both ends of each leg of the winding to terminal boards.

As an alternative, or an addition to balanced protection, a number of companies have installed permanent pipe connections and nozzles, so that the fire can be fought with water or steam. Carbon tetrachloride has also been suggested but has not met with much favor because of the large quantities required and the pretty well confirmed belief that it is injurious to installation. The weight of opinion and practice at this time favors water.

	1918		1919	
	Number	Watts	Number	Watts
Vacuum cleaners	3623	218050	7549	517790
Chafing dishes	159	66850	294	82400
Curling irons	1183	26415	1691	41682
Air heaters	8407	4998600	9416	5561700
Radiant heaters	4534	2710400	6359	3815400
Disc stoves	1015	592100	1627	1593700
Heating pads	3285	134650	4865	213540
Percolators	3186	1281740	6480	2616300
Toasters	3421	1619870	103.4%	104.1%
6-lb. irons	25710	13381845	31771	17784175
Laundry irons	453	365400	984	769350
Ranges	239	1888200	536	2614700
Water heaters	159	468000	368	1056500
Washing machines	2143	416600	6096	1196230
Ironers	116	22420	278	53100
Sewing mach. motors	1185	8875	1864	76965
			57.3%	76.7%

JOURNAL OF ELECTRICITY INDEX

The regular semi-annual index of the Journal of Electricity is now being prepared and will be published during the month of June. Copies will be sent to subscribers upon request sent to the Service Editor.



## Office Records—Their Filing and Indexing

BY IRENE WARREN

(The head of a busy firm realizes the importance of properly handling back correspondence because he has learned from experience that untold trouble may come from a single misplaced letter. In this tenth article of the series, the Director of the Chicago School of Filing and Indexing discusses the most successful methods of handling back files and explains follow-up systems, both for outgoing and incoming mail.—The Editor.)

### TRANSFER EQUIPMENT AND METHODS

The average firm transfers its letters once a year and sets up a new file for the coming year. The most approved method of transferring is to do it on a given date, usually the last day of the calendar year. It is never advisable to transfer merely because the folders are full. If a folder is full add another folder with the same name and divide the correspondence by dates or departments, or by whatever method is the best for serving the firm, and mark the folders accordingly.

Some firms find it better to transfer several times a year while others transfer only once in two years. The needs of the business should determine this. In highly specialized lines of business and professional lines, transfer periods are much longer; often the file is "weeded out" every five years, or a case that is completed is put in a "dead file." In lines that turn over business rapidly, the transfer is made every three or six months.

### Methods of Storing

In the past, firms have tied up bundles of letters and stored them away sometimes very inadequately labeled. When letters were needed from these bundles, hours of high-paid employees' time were wasted in the effort to find them. Some firms divided the letters carefully into fairly uniform size groups and bound them in loose-leaf binders, stored on shelves. For some time, it was the vogue to place the transferred letters in pamphlet boxes which were stored on shelves. The best modern method is to use transfer cabinets which are in size and style very much like the current filing cabinet but are less expensive in construction. The adjustments in the mechanism need not be so finely made, nor the materials so good, because they are less frequently used. Firms often keep two years' transfer files in the room with the current files and the rest of the years filed in a storage room perhaps miles distant, the information given from them coming by phone, letter or messenger. The transfer files in the current filing room are in units of four drawers in height, placed on the tops of the current files and a "shoe-shop" ladder, or a platform ladder is used to get at the contents.

### The Transfer Process

The transfer may be conducted in some such manner as this: Some time in the fall, the file clerk takes a pad of paper and goes through her files, writing down the labels for the new files. If there is a color scheme used, she indicates the colored labels to be written after each name listed. This list is turned over to the typist who writes the label sheets. These are pasted on the folders, and the folders sorted. Some clerks keep a card list of labels to be typed.

This is revised once a year or as changes occur from day to day.

The earliest year of the transfer file is packed and sent to the store room. The drawers with contents from the succeeding years are moved into their place, in proper order. The new folders, as they are written and sorted, are filed in the drawers for the last transferred year which will be left vacant for the current year's transfer. On the 31st day of December, with the aid of the office boys, the contents of the current files are placed where the new folders now are. The new folders are placed in the current files ready for the new year. This takes careful planning, but may be done with very little delay in daily routine. In many firms, the statutes of limitations controlling the time limits for collection of indebtedness in the state where the firm is operating, determines the time when the correspondence may be destroyed.

### Daily Correspondents

But there are certain correspondents from whom a firm receives letters daily and the clerk hesitates to transfer all such letters to a less accessible place on December 31st. In this case the file clerk may take the last folder for such correspondents, stamp the year very clearly in large type on the folder and leave it in the current files for a stated period of time, perhaps three months. The new folder would be filed in front of it. Hundreds of correspondents may be treated in this manner if desirable and some firms leave the entire file set up for fifteen months.

### FOLLOW-UP SYSTEMS

Two distinct types of letters need to be followed-up. The first are incoming letters, and the second are outgoing letters. In either event, the man who attends to the answering of the letters indicates to the file clerk that these letters must receive further attention on a given date which he names; he then dismisses it from his mind and the file clerk is responsible for seeing that the letters are brought to his attention on the date designated. If the follow-up is merely a form letter to be sent, the file clerk may send it without further consultation.

### Plan for Outgoing Mail

For those firms whose follow-up work is largely from outgoing mail, it is a good plan to make two carbon copies of the outgoing letter on different colored paper. One carbon goes into its regular place in the file and the other goes into the follow-up or tickler drawer.

In the follow-up system are guides for the twelve months in the year and supplementary guides for the thirty-one days in the month. The follow-up



carbon letter is filed back of the date on which it is to receive attention. In the early morning, the file clerk takes out the letters to be attended to that day, assembles any additional papers or information, and lays them on the employer's desk. In many concerns, the follow-up carbon copy is enough to refresh the employer's mind on the subject so he can write the customer without further data.

Follow-up systems are often so large as to take up a dozen or more drawers and miscellaneous tab folders bearing the alphabetic subdivisions are placed back of each date. The current date always stands first in the follow-up file. As letters for a given date are attended to, the date-guide is placed at the back of the file. Follow-up carbons are destroyed when the matter has been attended to.

It is never advisable to use signals in the regular correspondence files unless absolutely necessary, because they get pulled off in the hard use of a big

file. But there are dated correspondence folders on the market if they are needed.

### Plan for Incoming Mail

For incoming mail that needs to be followed-up, the card system is better. Each firm prints its own blanks to suit its peculiar needs. A five by three inch card is usually used which gives the name of the writer, the correspondence wanted, date of letters, and also the name of person wanting the letters and date when wanted with any additional instructions needed. These cards are filed back of month and day guides in the same manner used in the correspondence-size file just described. The file clerk each morning has to get out of the file the letters needed according to the instructions given on the follow-up card. The follow-up card is usually attached to the correspondence sent to the employer to show directions have been carried out. Cards for repair work are often filed in similar style by date.

## Cooperation in the Electrical Industry

(The following is an extract from the report of the N. E. L. A. Committee on Cooperation in the Industry, presented at the N. E. L. A. Pasadena convention. The members of this committee are: Chairman, Lee H. Newbert; vice-chairman, Robert Sibley; D. R. Bullen, A. P. Denton, John J. Gibson, R. S. Hale, N. W. Low, Wm. Creighton Peet, E. W. Rockafellow, and M. S. Seelman.—The Editor.)

"The Society for Electrical Development has achieved and promoted cooperation by means of its staff and by means of the work which it has incited its members and others to undertake and accomplish. The Jovian Order is intended to promote cooperation and in many instances its existence and its work have been of service to our industry. The National Association of Electrical Contractors and Dealers has worked out carefully a very complete and excellent plan for promoting cooperation, a plan which in some ways is quite similar to the California plan. The Commercial Section of our Association, working through its various bureaus and committees, has accomplished much and is planning to accomplish more. In addition to these four national movements, much cooperative promotion work has been done by the National Electrical Supply Jobbers' Association, the Conference Club, the various manufacturers' associations and others both nationally and locally.

"The primary object of the work of the California Electrical Cooperative Campaign has been to harmonize the various interests so that there would be unity of action. Practical cooperation means doing the other fellow's way if you can not get him to do your own way. Today, after nearly three years of consistent and conscientious effort under the inspiration of the cooperative idea, in California these ideals have become facts. Let us then briefly see how this wonderful change has been brought about.

1.—The Field men have visited and worked in various towns throughout the state as directed by the committee, and have made regular reports direct to the committee at headquarters as to results. They have proven tactful, flexible and of the highest service in meeting specific inharmonies that have arisen either between various branches of the industry or among individuals of the industry, or between the industry and the public.

2.—The Field men have arranged joint meetings of all electrical men for general discussions of their common interests and problems. The Advisory Committee has furnished suitable speakers for such meetings. Forceful instances of these meetings are recorded in the Technical Press of 1918-19, wherein groups of men, four hundred in number, have met in

banquet assembly in San Francisco and similar groups in Los Angeles from time to time. These men have represented all branches of the industry, members of the Public Service Commission and other prominent and influential citizens. Not only in the larger cities have such meetings been held, but in Sacramento, Fresno, Chico and Oakland, California, similar gatherings have taken place to spread the gospel of cooperation and helpfulness throughout the industry.

3.—The Field men, under the direction of the Advisory Committee, have brought the Central Station managers and employes to closer cooperation with the contractor-dealers.

4.—They have promoted better acquaintances between Central Station employes and dealer-contractors.

5.—The Central Station manager has as a result indicated to his organization and employes that it is his company's policy to support this cooperative campaign.

6.—The greater portion of the Field men's time in the town, however, has been spent with the dealers and contractors in assisting them in their efforts to improve their business methods, including accounting, sales, advertising and general store appearance, and also to secure their closer cooperation with the central station in their town.

7.—They have shown to the dealer-contractor the advantage of the retail end of his business and thereby encourage the dealer-contractor to give more attention to this important phase of his work.

8.—They have brought to their attention good merchandising methods.

9.—They have encouraged the proper arrangement of stores and show windows, particularly by showing photographs of well arranged stores and windows, and by assisting the dealer-contractor with his plans for improved arrangements.

10.—They have emphasized the advantage of tying in with national publicity campaigns and with central station advertising campaigns.

11.—The dealer has been encouraged to use good advertising material furnished by manufacturers.

12.—The dealer-contractor has been encouraged to adopt proper accounting methods, so that today California contractor-dealers have installed more of the national standard accounting systems than anywhere else in the nation.

13.—The Field men have shown to non-member dealer-contractors the advantage of membership in the California Association of Electrical Contractors and Dealers, as well as the National Association of Contractor-Dealers and the National Electric Light Association.

14.—The contractors have been encouraged to use high quality of material and workmanship and standard practice methods of estimating cost of installations.

15.—The Field men have convinced the contractor-dealers of the advantage of a closer cooperation with the central station and central station employes.

16.—They have caused the contractor-dealer to realize the necessity of giving prompt attention to work which they are assigned to do so that there would be little need for complaint either from the Central Station or customer due to the growing activities of the electrical contractor-dealer field of activity formerly covered by the Central Station.

17.—Architects, homebuilders and contractors have been urged to install sufficient outlets for the convenient use of all electric appliances, thus initiating a movement in the industry that today is assuming nation-wide proportions.

"There is no better evidence of the growing appreciation of this work than the increased cheerfulness and willingness with which subscriptions have been made for this activity. The work done during 1918 warranted its continuance, and a larger fund



was secured in 1919. Indeed, so enthusiastic have the contributors become in the efficacy of this splendid educative work in California that the fund subscribed annually has grown from \$12,400 in 1918, to \$18,000 in 1919, and to \$27,000 in 1920. The widespread interest in the work of the campaign was manifested by the number of new subscribers, among which, in addition to those representing the four branches of the industry, was the Technical Press, which also contributed much valuable publicity.

### Concrete Results

"We emphasize the value of such a movement and the actual concrete results in tangible values. While discord formerly prevailed, harmony is now in our industry. While chaos in stores was formerly common, businesslike establishments are today found on every hand and from a canvass of sales made in California, the result shows that 62% more sales were made in appliances during 1919 than in 1918, in spite of the fact that California even hitherto had boasted a saturation of electrical uses prevailing to a degree per capita nowhere else in the nation, and furthermore, in spite of the fact that the average selling prices had been increased fully 50%.

"For a single organization to attempt to dictate or control cooperative efforts would be inadvisable.

While the records show that the actual vote for organization of this important cooperative work in California took place at the Riverside convention of the Pacific Coast Section of the National Electric Light Association in 1917, your Committee feels that it would be an injustice to leave unrecorded the fact that the success of the movement in California was achieved not only through the fatherly influence of the Central Stations acting through the executive committee of the Pacific Coast Section of the National Electric Light Association from time to time, but equally through the activities of the California Association of Electrical Contractors and Dealers, the Pacific Division of the Electrical Supply Jobbers' Association and a helpful group of electrical manufacturers who in spite of their respective organizations were contemporaneously and harmoniously working at all times to align every element of our industry in California with this movement which has in the past three years accomplished such marked achievements.

"And finally, the Committee is of the opinion that to obtain the best results, two things are needed, the first being local organizations by states or groups of states as may best suit local conditions to carry on active field work, and secondly, national coordination and cooperation."

## Electricity in Pierce County Coal Mines

BY E. J. BARRY

(The coal mining operators of the state of Washington have found it much to their advantage to market all of the coal they produce, thus operating the mine entirely on power purchased from the power company. In the following article an electrical engineer of the Wilkeson Coal and Coke Company tells the story of how this Washington coal mine was made electrical throughout and how it set the pace for coal mine electrification throughout the vicinity.—The Editor.)

At the beginning of the year 1915 the Wilkeson Coal & Coke Company, with mines located at Wilkeson, Washington, realized that since all the surface coal that could be reached from the mine tunnel had been taken out, the only alternative to closing the mine lay in sinking a slope or shaft and going after the coal on another level. The mouth of the slope was approximately 8,000 feet in from the mine entrance so a steam line was out of the question. It was then decided to operate the hoist for getting out the coal by electric power purchased from the Puget Sound Power and Light Company, this company agreeing to run a transmission line to Wilkeson and locate a substation near the mine.

It was decided to bring the power in the entire distance of 8,000 feet by cable. A 4/0 three conductor, steel tape armored, and jute wrapped, rubber insulated cable, suitable for a working pressure of 2300 volts, was selected.

After considerable difficulty the 8,000 ft. of cable was put in position ready for the cable splicers. The slope hoist was driven by a 225-hp., 2300-volt, 600 r.p.m. motor with automatic contactor panel, operated by a master controller. There was also installed close to the hoist a 12 by 14 air compressor driven by a 75-hp. motor also of 2300 volts. This compressor supplied air to use on rock drills.

Power was turned on three days later and with but two interruptions due to damaged cable has continued ever since. A 1000-gallon per minute pump operating against a 660-ft. bend and driven by a 250-hp. motor has since been installed on the lower slope. Lighting is taken in the hoist room and down the slope from a 5-kw., 2200/110-volt transformer and this comprises the extent of the electrification inside the mine proper.

### Formation of Coal Seams in Washington

It is sometimes asked, why cannot coal be mined electrically in Washington as in the East, where coal-cutting machinery is practically universal. The answer is that the seams of coal in Washington run at an angle like one side of an inverted V and therefore cannot be reached with a straight bar cutting machine.

The practice in Washington is to run tunnels underneath the coal seams and tap seams into coal cars below. The seams will often cascade into the cars without any assistance on the part of the miner, but more often a powder charge is necessary to dislodge the coal.

### Haulage in the Mine

As before mentioned steam locomotives are still used to haul coal in the main tunnel, although stor-



age battery electric locomotives are used to bring cars from the working face to the main tunnel. The question of electric haulage, due to curves and grades in the main tunnel, is quite a problem. The steam locomotives, due to smoke and heat are a nuisance, storage batteries are out of the question due to grades and curves, and owing to continual settling of the roof and breakage of timbers a trolley wire could not be made to stay in working order more than a few hours, and the danger of shock from the naked wire is quite serious, especially as most of the mines are thoroughly water soaked.

It was the intention of the Wilkeson Coal & Coke Company at first to use electricity for the interior of the mine only, leaving the bunkers steam-driven as before, but shortly after the successful

to make possible starting up machines on cold mornings. A 100-hp., 2300-volt, 3-phase, 60-cycle, wound secondary motor was used to operate the bunkers and a similar size and type to operate the washers. Controls for both these motors were placed on the platform where convenient to the bunker foreman, the motors taking the place of the engines in the old engine room. A 35-hp., 440-volt crane type motor hauls the loaded car to the top of the bunker, where the coal is dumped. This is a balanced load, the empty car going down assisting the loaded car up the 40 degree slope. A 25-hp. crane type motor hauls the rock car out to the rock dump where refuse rock is disposed of.

A 100-kw. motor generator set wound for 110 volts provides direct current for charging storage



General view of the coal bunkers of the Wilkeson Coal and Coke Company of Wilkeson, Washington, showing the steam plant which has been closed down since the installation of electrical equipment throughout the mine.

inauguration of an electric drive there, the main engine driving the bunkers ran away, the flywheel burst, scattering destruction around, and three minutes later what had been a very fair sample of the old time mine engine room was a heap of junk. A piece of the bursting flywheel on No. 1 engine flipped the governor off No. 2, and No. 2 also ran away.

#### Installation of Electricity Throughout

This incident brought about the installation of electrical equipment throughout the mine, and so thoroughly has this been carried out that even the mine siren is operated electrically at present.

The starting effort on coal handling machinery, especially in cold weather, is very heavy. The coal has to be washed and naturally the washer freezes on winter nights when the bunkers are shut down. Therefore wound secondary motors were employed

batteries for electric locomotives and electric mine lamps, and also operates an electrically driven coke puller. This latter machine deserves some mention as it performs work that is becoming increasingly difficult to get men to do.

#### Operation of Coke Ovens

The Wilkeson Coal & Coke Company has 160 beehive coke ovens into which coal from the mine is poured through an inlet in the roof of the oven. Fire is then started and slow combustion begins, continuing for about 48 hours, when the coke is ready to be pulled. In the old style method a husky individual with a long steel rake appeared, and removing the clay sealed door of the oven began to rake out the glowing coke. It was hot and back-breaking work, made worse by the clouds of fine dust thrown off the coke as it fell to the ground in front of the oven.



The coke was then laboriously shoveled into wheelbarrows and trundled into the railroad cars waiting near by. The electrically driven coke puller does the work of thirty men.

The coke puller runs on a track in front of the ovens and can be stopped at any point. It is equipped with a long steel arm on a rack and pinion which drives into a mass of coke and rakes it out to a moving conveyor which forms part of the machine. This conveyor loads directly into the coke carrier on the railroad spur, loading a car in one-tenth the time taken by the old method.

Power is conveyed to the mechanical conveyor by overhead trolley, return being made through a bonded rail. A motor driven coke hauler has dis-

Energy is taken to the coal company's 4-panel switchboard from the 2300-volt lines of the Puget Sound Power and Light Company and thence distributed to the mine, bunkers, fan, etc. There is a total connected load of 1120 horsepower, mostly in large units.

Motors over 35 hp. are all wound for 2200 volts working pressure and although some fear was expressed that this would be a dangerous voltage to use in a coal mine, five years of operating experience has demonstrated to the contrary.

#### Economy of Using Electricity

Coal at a coal mine is always thought to be a cheap commodity and such economy in fuel consumption as might be attained by covering long steam



The electrically operated coke puller which runs in front of the coke ovens of the Wilkeson Coal and Coke Company. This machine does the work which before required thirty men. This conveyor loads directly into the coke carrier on the railroad spur, loading a car in one-tenth the time taken by the old method.

placed the old and faithful mule that hauled the coal to be dumped into the ovens. Electricity has displaced human and brute labor wherever it was feasible to do so, and the mine management has never regretted the change in the years of operation since it was made. A 100-hp. motor driving the fan supplies pure air to the mine workings.

One matter instantly appreciated by the management was the decidedly greater freedom from breakdowns with electric drive as compared with steam. Conveyor chain breaks had come to be looked on as a necessary evil under the old system, and rarely a day passed without a shut-down of from one to two hours due to this cause. With the steadier electric drive this trouble disappeared almost entirely, much to the joy of those concerned. The varying engine speeds had been responsible for most of the mishaps in the past.

lines is unthought of. The coal that one time was carelessly shoveled into furnace fires at the mines of the Wilkeson Coal & Coke Company is now sold, bringing a good price in the open market. The labor that did the shoveling is now better employed in getting out more coal. From these two items alone the saving in the use of electricity over steam is placed at a conservative estimate at \$60.00 per day. Therefore in a working year the net gain in favor of electricity from these items alone is \$18,000—this item after all incidental charges of interest, depreciation, and cost of purchased power have been deducted. The management is very whole-hearted in their appreciation of the advantages and economies of electric drive, and their example encouraged many other mining companies in the vicinity to follow suit, with the result that now practically every mine of standing uses electric drive.



# A New Theory of Matter

BY A. C. CREHORE, PH.D.

(In eleven previous discussions the author, one of our most noted present day physicists, has laid the thorough foundation work for this final and conclusive chapter on his New Theory of Matter. The electron revolving in a circular orbit, and the mechanical forces that result are here taken up in an interesting and convincing manner, which should serve to offer new and conclusive proofs concerning the necessity for establishing new theories of matter than those which have formerly been thought to be sufficient.—The Editor.)

In several places in the foregoing sections reference has been made to the author's theory of the atom. A brief account only of this theory will be given in this section, and for a more detailed description the reader is referred to the author's book "The Atom." Use is made of electromagnetic theory in part and also of the Einstein equation connecting energy and frequency by a constant ratio, namely Planck's constant, which has been referred to above.

## The Electron in a Circular Orbit

When an electron revolves in a circular orbit, as it is supposed to in the normal undisturbed state of all atoms, it exerts a certain mechanical force upon the stationary nucleus of an atom at a great distance away. It may be shown by means of the Lorentz form of electromagnetic theory that the mechanical force thus exerted by the revolving electron upon the distant atomic nucleus, due to its motion alone, is a circular force, provided the plane

of the electron may then be represented by a vector having the opposite direction to the position of the electron itself, namely the position vector. Both vectors, the position vector and the acceleration vector, always remain in opposite directions as they each revolve at the same rate, and thus describe circular paths. The direction of the force exerted upon the distant atomic nucleus is therefore in the same direction as the position vector, and opposite to that of the acceleration.

## When the Orbit is Perpendicular to the Line of Centers

If, now the plane of the orbit of the revolving electron is turned so that it does not occupy a plane perpendicular to the line referred to joining centers, then the electromagnetic theory tells us that the mechanical force exerted upon the distant stationary nucleus is proportional to that portion only of the acceleration which is resolved in the plane perpen-

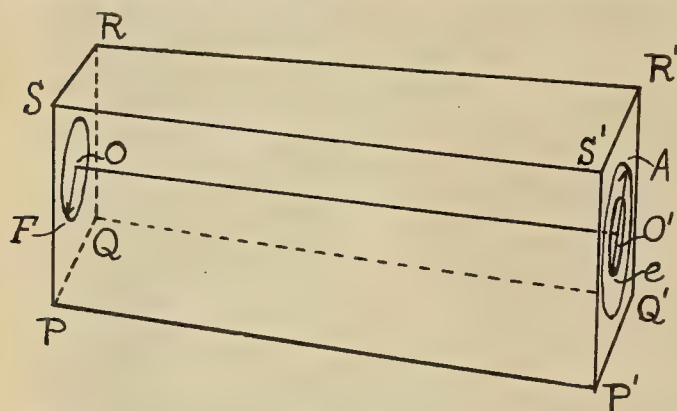


Fig. 2

The box-like framework is used to assist the eye in locating the geometrical objects in space. *O* represents the position of the fixed atomic nucleus and *e*, the instantaneous position of this revolving electron in the hydrogen atom. The circular orbit which is described is represented in perspective about the fixed center *O*.

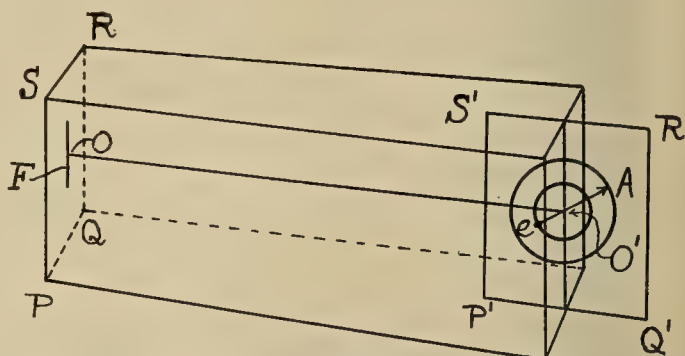


Fig. 3

of the orbit of the revolving electron is perpendicular to the line joining the centers of the stationary nucleus with the center of the orbit. That is to say, this mechanical force may be represented by a vector having a constant magnitude but revolving at a uniform rate around the stationary nucleus as a center. It may thus be represented by an imaginary circle with the nucleus as a center, the plane of the circle being parallel to that of the orbit of the distant revolving electron, and the frequency of the revolving force the same as that of the revolving electron.

Moreover, this mechanical force is proportional to and in the opposite direction to the acceleration of the revolving electron. When an electron revolves in a circular orbit at a uniform rate the acceleration of it has a value constant in magnitude only, but continually changing in direction, since it must always be directed towards the center of the circle in which the revolution takes place. The accelera-

tion of the revolving electron is perpendicular to the line of centers, and that it is always confined to a plane perpendicular to this line. Or, in other words, the plane in which the mechanical force is exerted is invariable, always being in a plane perpendicular to the line of centers, even though the plane of the orbit is not. And, again, the component of the acceleration of the revolving electron which is in the direction of the line of centers has no effect in producing any force upon the stationary nucleus.

These statements may be easier to comprehend by reference to Figs. 2 and 3. Let *O* be the position of the fixed atomic nucleus, say that of an atom in the photographic plate receiving the radiated energy from an electron in the distant hydrogen gas. Let *e* represent the instantaneous position of this revolving electron in the hydrogen atom describing a circular orbit represented in perspective in the figure about the fixed center, *O*. To render the positions of these fixed points and planes referred to more



apparent, use is made of a sort of box framework which is for no other purpose than to assist the eye in locating these geometrical objects in space by means of a figure drawn in a plane.

The fixed nucleus is located in the center of the plane PQRS at the left end of the box. The orbit of the revolving electron is shown by the small ellipse, as representing a circle in perspective on the right end of the box in the plane P'Q'R'S', which is parallel to PQRS, about the center O'. These two planes are each perpendicular to the line OO' joining centers. The acceleration of the revolving electron is then represented by the revolving vector O'A, which has the opposite direction to the position vector O'e. In this case the mechanical force exerted by the electron e upon the stationary nucleus O is represented by a circle in the plane PQRS about O as center, and the instantaneous position of the force vector, OF, is opposite to the acceleration O'A, and the same as the position vector O'e.

If, now, the plane P'Q'R'S' is turned around through a right angle, as represented in Fig. 3, carrying with it the orbit of the revolving electron, e, then the mechanical force exerted by it upon the stationary nucleus at O is still in the same plane, PQRS, but it is not now represented by a circle but by a vertical straight line in this plane. The instantaneous position of the force vector is OF, which describes a harmonic motion up and down this vertical line. For any position of the plane P'Q'R'S' intermediate between the parallel position as in Fig. 2 and the perpendicular position as in Fig. 3, the force-vector still remains in the same plane, PQRS, but is then represented by an elliptical motion in this plane about O as center, the circle in the first instance and the straight line in the second being but particular cases, the limiting cases, of elliptical motion.

#### As Viewed from the Stationary Nucleus

If we should view the orbit of the revolving electron from the stationary nucleus, it would appear as an ellipse in general when the orbit is not perpendicular to the line of centers. This ellipse represents the path of the position vector of the electron resolved in a plane perpendicular to the line of centers. Similarly, the circle representing the acceleration of the electron would appear as an ellipse when viewed from the same point, and this ellipse represents the resolved portion of the acceleration in a plane perpendicular to the line of centers. The mechanical force upon the distant nucleus is proportional to this resolved portion of the acceleration but in the opposite direction, and, hence, the mechanical force exerted upon the nucleus is an elliptical force, still, however, being in a plane perpendicular to the line of centers.

These ideas may be applied to obtain the effect of several electrons simultaneously acting upon the same stationary nucleus. If it is supposed that the selected stationary nucleus represents just one typical atom, say, in a photographic plate receiving the radiated energy from a distant mass of gas confined in a vacuum tube, then it may be supposed that the

record produced upon the plate after development will depend entirely upon the radiated energy received by the atomic nuclei of the plate, and that what is received by one atom is also received by another. It is also to be inferred that the energy received by each nucleus is directly related to the mechanical force acting upon the nucleus during the reception of the radiated energy, but this, as we have shown, depends upon and is proportional to the acceleration of the revolving electron in the distant gas. The total force upon the nucleus is proportional to the total vector sum of the accelerations of all of the revolving electrons in the mass of gas resolved in the plane referred to, whose radiated energy reaches the photographic plate and the stationary nucleus of an atom in the plate.

#### An Example in the Hydrogen Atom

Assuming that there are two electrons in the normal state of each hydrogen atom situated at the opposite ends of a common diameter, the sum of the accelerations of the two electrons in one atom is evidently zero, for each is represented by a revolving vector of equal magnitude and opposite direction to that of the other, the geometrical sum of the two vectors being zero. If this is true of one atom it is true of them all. Hence, it follows that the mechanical force exerted upon the distant stationary nucleus in the photographic plate is zero for each hydrogen atom independently, and therefore, is totally equal to zero. The plate will show nothing upon development after exposure to a mass of hydrogen gas in its normal condition. This is in entire agreement with the observed facts, and this also explains in a satisfactory manner why the total radiation from a normal mass of hydrogen gas is zero.

It is not so easy to explain this matter if we should assume that each hydrogen atom has but a single electron in accordance with the Bohr theory of the atom. In such a case the force due to each atom independently would not be zero, and whether the total force due to a multitude of such atoms in a mass of hydrogen gas is completely zero or not must depend upon the statistical question how completely the forces due to different atoms annul each other on the average. The chances that they will annul each other seem to be considerably greater if it could be assumed that the radii of the orbits of the electron in every atom is the same, and that the frequencies of revolution are also the same in every atom. But, the Bohr theory of the atom does not make these radii and these frequencies the same, and the probability that there will be a complete cancellation of the resulting force upon the stationary nucleus is thereby made far more improbable than it would otherwise be.

No attempt has been made to solve this statistical problem so as to show that the radiation from the Bohr hydrogen gas should be zero according to electromagnetic theory, because the matter has lost its interest. The two electron atom fills all the requirements perfectly not only in this respect but in every other respect that has been presented.



### Extension of Theorem by Fourier's Analysis to Any Form of Motion of Electrons

It may now be shown that the theorem above mentioned as to the mechanical force due to a revolving electron upon the stationary nucleus of the distant atom is perfectly true according to electromagnetic theory for any kind of motion of the revolving electron, whether it follows a circular path or not. That is to say, the theory shows that the mechanical force is proportional to the resolved acceleration no matter what its character may be. A little reflection will show that this is a direct result of the theorem as established for simple circular motion. Suppose, for example, that two independent circular motions are geometrically added together. They may each have different radii and periods. The resulting curve may be considered to represent the complex path followed by the electron in question. The resulting mechanical force due to an electron thus moving would be the same as if two electrons were revolving in circular orbits of the radii and frequencies above mentioned, and, since each of these two component forces is proportional to the resolved acceleration of the electrons respectively, the resulting force is just the same as if the single electron moved in the curve compounded of the two circular motions.

Now, any motion of an electron whatever represents a certain acceleration, and any acceleration whatever may be resolved into an infinite series of simple circular accelerations according to Fourier's well-known theorem. Each of these component circular accelerations contributes its proportional mechanical force upon the distant stationary nucleus, and the total force is proportional to the sum of the component accelerations resolved in the perpendicular plane. The sum of the component accelerations is again equal to the actual acceleration in any complex path whatever that the electron may follow. The total mechanical force is then proportional to the actual resolved acceleration.

### Observation by Means of the Photographic Plate

The next step in the process of arriving at an atomic theory is to go to the photographic plate to observe what effect is produced upon it when the hydrogen gas is not in its normal condition, but when it is caused to radiate energy due to being bombarded by electrons from some external source. By the use of a diffraction grating or of a prism it is possible to sort out, as it were, the component frequencies that exist in the radiated energy, and to obtain an exact measure of these frequencies. The result which has been experimentally obtained from hydrogen is that the energy radiated is always emitted at some definite frequency, and that no other frequencies have ever been observed by the use of hydrogen gas than those expressed by the simple mathematical formula

$$\nu = K \left( \frac{1}{\tau_2^2} - \frac{1}{\tau_1^2} \right).$$

In this formula  $K$  represents the important Rydberg's constant, which has been discussed in the foregoing sections. It not only appears when

hydrogen is employed but also when other elements are used, but in a different way in each case. The  $\nu$  represents the frequency of the received energy, and the  $\tau_2$  and  $\tau_1$  stand for integers, 1, 2, 3, etc. Any values of  $\tau_2$  and  $\tau_1$  may be substituted in the formula, and the resulting frequency calculated will be found to be emitted by the hydrogen gas under the proper conditions. The only restriction is that those values of these integers which make the frequency come out with a negative sign are prohibited, no meaning being attached to a negative frequency. Moreover, no other frequencies than those given by this formula are ever observed by the use of hydrogen.

It may be inferred immediately from these facts that the force acting upon the selected stationary nucleus of an atom in the plate always has the same frequencies, and then, by means of the theorem just given, that the sum of the resolved accelerations of the electrons in the hydrogen gas emitting the radiation contains these frequencies and no others. This gives the first intimation regarding the component frequencies in the acceleration of the motion of the electrons of the gas that we have possessed. But, because it is merely a sum of the effects due to a multitude of atoms, it is not as satisfactory as if it told something about the acceleration of an individual electron.

### Frequencies Emitted by Hydrogen

It shows, however, that it is possible that the frequencies emitted by hydrogen are due entirely to the character of the motion of the electrons in the gas, that is to say, to the form of the orbits followed by the electrons, when disturbed and compelled to depart from their normal circular motion. It is well known that, as soon as the cause of the disturbance is removed, the electrons quickly return to their normal condition again and cease to radiate energy. What happens to an individual atom may be pictured by imagining that the electrons are driven out from their circular orbits, one of them going out to some maximum distance from the nucleus, and then returning again after the disturbance is over. The paths, by which these electrons return to their original orbit, cannot possibly be simple circular paths, and, unless the paths are circular, their accelerations cannot possibly be simple circular accelerations. Any other form of path demands more than one simple circular acceleration, which is the same as saying that these quasi spiral paths demand more than one frequency of vibration. And, again, since the motion ends finally in the original circular orbit from which it started, the case of a single atom demands that a series of frequencies shall be emitted at once in one operation of the two electrons, and that the frequency shall gradually fade away and become zero when the final orbit is attained. For, in this orbit the radiation has no frequency. As the periods of the two electrons approach equality in attaining this orbit, their difference, or vector sum, becomes less and less until it vanishes altogether.

It is possible to write the equation above given for the frequencies emitted by the hydrogen gas as follows:



$$\nu = K \left( \frac{1}{\tau^2} - \frac{1}{(\tau + \tau_2)^2} \right).$$

This form is exactly equivalent to that previously given, in that it gives every line of the hydrogen spectrum just as the former did, but there is a difference between the two forms in the succession of lines obtained by fixing the value of  $\tau_2$  and giving to  $\tau_1$  in the first formula, or to  $\tau$  in the second form, a succession of integral values. In the second form the frequencies obtained evidently fade away for increasing values of  $\tau$  finally to zero, no matter what value is assigned to  $\tau_2$ . This is evident because  $1/\tau^2$  and  $1/(\tau + \tau_2)^2$  tend to equality the larger  $\tau$  becomes, and their difference tends towards zero. In the original form the frequencies tend to increase to a "head" value as we increase  $\tau_1$ , letting  $\tau_2$  remain fixed.

The author's theory is that an infinite series of frequencies is emitted by the two electrons in one atom as they are returning to their original orbit after being disturbed, and that these frequencies correspond exactly to those in the second equation just given, when  $\tau_2$  has some fixed value. On a different occasion  $\tau_2$  may have a different value and the electrons go out to a different distance from the nucleus, and give a different series of frequencies on returning. A multitude of atoms will thus give all of the lines observed in the spectrum of hydrogen.

#### Differences Between the Author's Theory and Bohr's Theory

The difference between this theory and the Bohr theory alluded to is that the Bohr theory assumes that one single vibration frequency only is emitted in one operation of an electron, in changing over from a circular orbit of a larger radius to a circular orbit of a smaller radius. It is impossible under this hypothesis that these frequencies should be due to the orbital motion of the electron, for, the path in changing over from one orbit to another cannot possibly be a simple circular path, and the acceleration cannot, therefore, have a single harmonic frequency as supposed. The Bohr theory offers no explanation whatever of the source of these vibrations, and leaves the matter surrounded in mystery.

By making certain reasonable assumptions concerning the accelerations of the two electrons in the hydrogen atom, the author has worked out possible forms of the orbits described by the two electrons in returning to their original orbit, such that the sum of the accelerations of the two contains only those frequencies of vibration that are contained in a single one of the series of frequencies contained in the second form of frequency equation above given, when  $\tau_2$  has one fixed value. The form of path and the rate of motion of the electrons along it gives a complete explanation of the production of these observed frequencies, and no others.

#### The Einstein Equation as a Check

By treating the case by the principle of the conservation of energy, and by the use of the Einstein equation above referred to, it has been possible to arrive at an expression for the energy required to

pull the electrons completely away from the nucleus of the hydrogen atom, and from this to obtain numerical values of the so-called ionizing voltages for hydrogen. For a more complete treatment of this phase of the subject the reader is referred to the book, "The Atom." It can merely be stated here that the ionizing voltages thus obtained for hydrogen are as follows:

$\tau_2$	Ionizing voltage
1	15.496
2	13.806
3	13.055
4	12.631
5	12.361
6	12.172
7	12.034
8	11.927
9	11.845
10	11.776
....	.....
$\infty$	11.132

It is considered that these results are in remarkably close agreement with the experimental values of these voltages for hydrogen. It has been observed that ionization sets in at about 11 volts, and a trifle over. This corresponds to the value of  $\tau_2 = \infty$  in the above table, and this is the minimum value. Nothing whatever is observed to happen in hydrogen until this voltage is reached. A new type of ionization has also been observed at about 15.8 volts by Davis and Goucher. This is very close to the upper limit, or maximum value in the table corresponding to  $\tau_2 = 1$ . A distinctive point has also been observed at about 13.6 volts, which corresponds to  $\tau_2 = 2$  in the table.

The other intermediate values just above 11.132 volts are so close together that it would not be possible to distinguish the individual voltages called for corresponding to large values of  $\tau_2$ , because the experimental data merges these humps into a smooth curve. The ionization is shown by the table to be nearly continuous after 11.132 volts is reached until we come to the small values of  $\tau_2$  near the top of the column.

It ought to be stated that the Bohr theory of the atom gives a maximum ionizing voltage of about 13.54 volts, which is not in agreement with the experimental facts. It is considered that the obtaining of numerical values of these voltages in close agreement with observations from the new theory of the atom is strong support for the ideas lying back of the theory.

#### THE SOLAR LIGHT AND POWER PLANT

The underlying principle of the solar light and power house is the drawing of heat from the sun's rays into a moving sheet of water, which passes up and down through a series of zigzag passageways under a double thickness of glass. The sun raises the temperature of the water to 150 degrees. The heated water passes into a sulphur dioxide boiler and this water later returns to the glass heating tanks. The heated water at a temperature of 150 degrees or more runs off through a pipe into a storage tank, insulated with layers of dry sand. At a plant of this sort which has been installed in Arizona the water remained hot from four to ten days when stored in this tank.



## SPARKS—Current Facts, Figures and Fancy

(Items which predict great speed increases in airplane and railway travel appear on this page along with condensed information concerning the energizing of farms by electricity, the latest and largest elevator system and the present status of foreign currency.—The Editor.)

Among European countries Norway ranks first in water power wealth. She has given unusual attention to the use of water power and was able to face with ease the great shortage of coal brought about by war conditions.

\* \* \*

It is estimated that two and a half billion dollars must be spent in the next three years for railroad improvement. This fact is of especial interest to the electrical industry since there is reason to believe that a considerable part of the tremendous sum will be devoted to electrification.

\* \* \*

Canada probably has in use a greater proportion of aluminum transmission lines than any other country. A recent survey by the Commission of Conservation shows that on all lines in the Dominion operating at 10,000 volts or over, there are 13,000 wire-miles of aluminum and 8,000 wire-miles of copper.

\* \* \*

One hundred and sixty miles per hour is considered pretty good speed by most people today, but this pace will undoubtedly be a bit too slow for practical purposes in the days to come. The president of the French Aero Club states that the recent invention of a turbine motor promises an airplane speed of 250 miles per hour within a few years.

\* \* \*

The electric railway has extended even to easy-going old Madrid. The new subway opened there recently is equipped with metal coaches carrying two motors of 175 hp. each. The cars are divided into first and second classes, and a motorman and conductor comprise the crew for each "train," consisting of one motor car and one trailer.

\* \* \*

When one reads of the latest largest elevator system in the world, one realizes that the elevator boy will soon be a thing of the past. This largest system in the world is the installation of 96 "operatorless" elevators at the Brooklyn Army Supply base. These are set in banks of ten—each bank being handled by a central dispatcher instead of ten individual operators. On these elevators is a "micro" leveling equipment which automatically controls the floor leveling of the car to the extent that each elevator is brought within a quarter of an inch of the floor level without the attendance of an operator or guard.

\* \* \*

In view of recent discoveries it appears that the farmer will soon use as much or more electricity than any other production factor in this country. A practical and inexpensive method of transmitting electrical power from main transmission lines direct to the farms is being perfected. In this way it will

be practical to serve all farms for 50 miles on each side of the main power line. The energizing of farms by electricity is strongly advocated, since science proves that this would increase the productivity at least 25 per cent. By means of wires stretched across the fields the fields can be energized at night when other power demands are negligible. It is predicted that it might be possible with electrical energizing to grow two crops in one year.

\* \* \*

We in America are apt to grumble over the small amount the dollar will buy, but it is well in this connection to consider the currency depreciation in some of the countries of central and eastern Europe. Based on recent market quotations the depreciations showed as follows: Austria, 97.53%; Hungary, 97.58%; Germany, 92.38%; Greece, 43.26%; Rumania, 91.81%; Poland, 97.98%; Czecho-Slovakia, 92.76%. This means that if these various peoples were to buy materials in America at the present market value of their currencies, Austria and Hungary would have to pay forty times the normal cost, Germany thirteen times, Greece twice, Rumania twelve times, Poland (Cracow) fifty times, and Czecho-Slovakia fourteen times the normal cost. Their currencies are depreciated because they have neither gold nor sufficient production with which to maintain their normal position either with the United States or with their own immediate neighbors.

\* \* \*

Those who feel that they do not care to leave terra firma even for the purpose of gaining time through the patronage of airplane transportation are glad to learn of the recent invention of the electric monorail car, which is reputed to be the fastest method of transportation. It is perfectly plausible that cars placed on a single line of wheels will run much faster than if placed on a double rail as at present, and it further follows that if a car or locomotive can be made to run on a single rail in a normal, stable and upright position, it must necessarily travel faster than the ordinary trains, at the same time using an equal amount of fuel or electricity. Two methods of applying the monorail system have been proposed. Electric current for propelling the cars may be taken from a trolley wire or a third rail, and the current returned through the center monorail on which the cars run. The cars may be propelled, either by having an electric motor or motors drive large friction wheels which protrude through openings in the side of the car, so as to buck against flat friction rails on the side of the trough through which the cars run, or else they may be operated by gear wheels protruding from the sides of the cars, which gears may mesh or engage two toothed racks placed along the sides of the conduit.



## PERSONALS

**L. H. Newbert**, manager of the commercial department of the Pacific Gas & Electric Company, with headquarters at San Francisco, has been elected president of the Pacific Coast Section, N. E. L. A. Mr. Newbert has long been a forceful factor in the electrical industry in the West. In the early days of the Pacific Gas & Electric Company, back in 1900, he was engaged in the activities of this company in and about Marysville, California. His business ability was early recognized and he was transferred to San Francisco to take charge of

the sales department. Later when the commercial department and the sales department were amalgamated he became the head of the commercial department, which position he at this time occupies. In the work of the California Electrical Cooperative Campaign, Mr. Newbert has been chairman of the Advisory Committee since its beginning, and has at all times been the steadying hand that has guided this institution to its place of helpfulness which makes it recognized today as a potent and powerful factor throughout the nation. We look to the new year now upon the Pacific Coast Section N. E. L. A. as one full of promise and accomplishment under Mr. Newbert's guidance.

**W. H. Whiteside** of the Westinghouse Electric Company, Pasadena, has been spending a few days in San Francisco.

**E. W. Clark** of Los Angeles, vice-president of the Union Oil Company, made a visit to San Francisco a short time ago.

**J. R. Lovejoy**, vice-president of the General Electric Company of Schenectady, N. Y., is a recent San Francisco visitor.

**L. K. Comstock**, president of the newly enlarged Conference Club of New York, took in all three conventions, as appropriate to the mission of his organization.

**J. H. Wiggins**, assistant engineer, U. S. Bureau of Mines, who has been stationed at the San Francisco office of the Bureau for the past six months, has returned to his headquarters at Bartlesville, Oklahoma.

**T. W. Simpson**, of the Federal Sign System (Electric) of San Francisco gave a talk on "The Reason Why of Electrical Advertising" at the Pacific Coast Advertising Clubs' convention which was held last week in Stockton.

**J. D. Cave**, who is returning to Melbourne, Australia, after a number of years in the United States, goes back to Australia to develop a line of importing in connection with his father's long-established business in electrical and mechanical equipment.

**John C. Merriam**, professor at the University of California, has been elected president of the Carnegie Institute of Washington, to succeed Robert Wood Ward, who is retiring at his own request at the end of the year. Dr. Merriam is professor of paleontology at the California university and was acting chairman of the National Research Council, 1918-19.

**F. D. Fagan**, Pacific Coast sales manager of the Edison Lamp Works of the General Electric Company, has been elected president of the California Industries Association. He has been a director of the association for the past two

years and is said to be the youngest man ever elected to the presidency.

**L. C. Gordon**, business manager of Ingenieria Internacional, a McGraw-Hill trade magazine published in Spanish, has been in San Francisco during the past few weeks. Mr. Gordon spoke at the National Foreign Trade Convention and presented Mr. McGraw's paper on "Service of the Technical Press to Foreign Trade."

**James H. McGraw**, president of the McGraw-Hill Company, was unable to be in the West for the N. E. L. A. Convention or the National Foreign Trade Convention. The paper on "Service of the Technical Press to Foreign Trade" which Mr. McGraw was to present to the delegates at the Foreign Trade Convention was read by Mr. L. C. Gordon. Mr. McGraw intends visiting the West some time during the month of June.

**J. E. Davidson**, chairman of the newly created Public Relation Section of the National Electric Light Association, is vice-president and general manager of the Nebraska Power Company. Mr. Davidson is a well known figure in the West, as for some years he was vice-president and general manager of the Pacific Power & Light Company at Portland, Oregon, and proved a most active figure in electrical matters in the Northwest. He remained in Portland until 1917 when he went to Omaha to assume his present position. During the past week or ten days he has been visiting various power centers in the West, including his old home town of Portland.

**H. W. Crozier**, engineer with the firm of Sanderson and Porter, San Francisco, is at present working in France in connection with the installation of a double oil pipe line between Havre and Paris, a distance of about 150 miles. It is anticipated that 4,500 tons of heavy and 1,000 tons of light oils and spirit can be pumped through these lines daily, thus materially lightening the difficulty of supplying Paris with coal by facilitating the use of heavy oils as a substitute. It is hoped to complete the lines in time for next winter. The estimated cost is about three million sterling at the normal rate of exchange. Mr. Crozier is a Western man, having graduated from the University of California. He is considered an authority on the subject of oil pipe line transmission. Articles by him on this subject appeared in the January and February first issues of the Journal of Electricity.

**R. L. Smith** has been appointed by the Advisory Committee of the California Cooperative Campaign to serve as field representative in the bay district, the territory formerly covered by Curt C. Davis. Capt. Smith was graduated from Rose Polytechnic Institute with the class of '09, after which he spent some time with the Westinghouse Company at Pittsburgh. Later he served in the electrical engineering department of the Pacific Electric Railway in Los Angeles, which position he left to join the sales organization of the Pacific and Power Corporation. When the properties of the latter were purchased by the Southern California Edison Company, Capt. Smith was appointed district agent at Vernon, one of the principal industrial districts in the South. He resigned to enter military service and achieved the rank of Captain, spending two years in the army. He served with the Eighth Division of Engineers both in the States and in France, and later served with the Second Division in Germany.





## Personalities of Pasadena



R. H. Ballard, president and general manager of the Southern California Edison Company and retiring president of the N. E. L. A., gazing with pride upon his successor, Martin J. Insull, president of the Middle West Utilities Company, who has been newly chosen leader of the N. E. L. A. for the coming year.

Thos. Norberg Schultz, manager of the municipal electric works of Kristiana, Norway, came the longest distance of any of the delegates to attend the gathering. Mr. Schultz for thirteen years has been president of the Norwegian Electricity Works Association and is the vice-president of the Electricitetskommission of Norway. He is spending some time on the Pacific Coast, looking into operating methods of Western companies.

D. L. Huntington, president of the Washington Water Power Company, Spokane, headed a delegation of more than thirty from Washington, among whom were Geo. E. Quinan, electrical engineer, and R. C. Saunders and R. W. Clark, assistant sales managers of the Puget Sound Power and Light Company, Seattle, as well as E. A. Batwell, R. A. Lindley and W. H. McGrath of the same company. P. A. Bertrand represented the Grays Harbor Railway and Light Company, Aberdeen, while A. M. Chitty of the Puget sound International Railway Company represented Everett, Washington, in the group. Among the delegates from the Washington Water Power Company should also be mentioned John B. Fisk, consulting engineer, and Lewis A. Lewis, commercial agent. In addition to those who came down on the special train, a number of manufacturers and jobbers attended the Jobbers' Convention at Del Monte and then continued south to Pasadena.

Dr. Henry Suzzalo, president of the Washington University, Seattle, was among the honored guests at convention. Dr. Suzzalo's institution has done much in cooperation with progressive forces in all branches of state activity.

Benjamin Wolf is the new radio supervisor of the Pacific for the U. S. Shipping Board and will have his headquarters in San Francisco.

W. J. Meara, manager of the New York Edison Company, is a recent San Francisco visitor. Mr. Meara came to San Francisco ahead of the Red Special upon which he was traveling and later joined it in its trip back through the Canadian Rockies.

F. D. Schwartz, of Illinois Rubber and Insulated Wire Company, has been at the conventions and is taking a general trip down the coast.

P. S. Millar, general manager and secretary of the Electrical Testing Laboratories of New York City, is a recent Pacific Coast visitor where he has attended the Pasadena Convention of the N. E. L. A., and later has spent several days in San Francisco and other Pacific Coast cities.

F. V. Burton, accompanied by Mrs. Burton, attended both the Jobbers and N. E. L. A. conventions and is an enthusiastic coast visitor.



A. E. Morphy, secretary of the Southern California Edison Company and assistant convention chairman (on the left), and W. L. Frost, assistant general agent of the Southern California Edison Company and chairman of the convention entertainment committee, to the work of which two gentlemen so much of the pleasure of the Pasadena convention was due.

W. D. Steele, general sales manager of the Benjamin Electric Company, Chicago, was a convention visitor.

Fred Skeel, western representative of the Crouse-Hinds Company, and A. F. Hues, sales manager from Syracuse, attended both conventions and returned home through the Northwest.

O. B. Coldwell, second vice-president of the Portland Railway, Light and Power Company, was largely responsible for the enthusiastic representation from the northwest, particularly the generous sprinkling from the Beaver City. Franklin T. Griffith, president of the Portland company, C. P. Osborne, superintendent of power, and A. C. McMicken, sales manager, were among the representatives from the Portland Railway, Light & Power Co., while the Pacific Power & Light Co. sent among others its president, G. W. Talbot, W. M. Wood, H. H. Schoolfield, chief engineer, and Lewis A. McArthur, general manager. Other power companies from this district which were represented were the North Coast Power Company in the person of R. M. Boykin, vice-president, and the Bend Water, Light and Power Company of Bend, Oregon, whose manager, T. H. Foley, was a member of the party.

J. Nelson Shreve of Holabird Electric Cable Company was at Del Monte and Pasadena, and is taking advantage of the trip to visit other coast cities.

R. J. Davis, Pacific Coast representative of the Century Electric Company, has returned to his San Francisco headquarters after several weeks' visit to the business centers in the East, particularly at his home company in St. Louis, Missouri.

J. A. Clay, general manager of the Western Colorado Power Company, L. M. Gazin of the Trinidad Electric Company, C. A. Semrad of the Western Light and Power Company, G. H. Walbridge, chairman of the board, Colorado Power Company, and T. O. Kennedy, of the Denver Gas and Electric Company, were among the twenty or more delegates from Colorado—one of the strongest delegations sent from any state to convention.

W. H. Archbold of Archbold-Brady Company was an interested visitor at the Pasadena convention and expressed himself as being very enthusiastic regarding the future business outlook on the coast.

P. S. Klees of the Pierce Fuse Corporation, Buffalo, New York, is visiting the Pacific Coast renewing old acquaintances.

E. W. Rockafellow, Western Electric Company, New York, attended the Jobbers' Convention at Del Monte and the N. E. L. A. Convention at Pasadena, and is also visiting Western Electric branches on the coast.



# N. E. L. A. Convention



An active representation covered convention from Boston. Wm. H. Atkins, general superintendent of the Edison Electric Illuminating Company of Boston Mass., (on the left), conversing with R. S. Hale, superintendent of the special research department of the same company and community somewhere in the Hotel Huntington grounds.

A. D. Blake, managing editor of Power, and G. E. Andrews, business manager, were among the twenty-three representatives of the McGraw-Hill Company from the New York and Pacific Coast offices who attended convention. Among the others were: W. H. Onken, Jr., editor Electrical World; O. H. Caldwell, editor Electrical Merchandising; Robert Sibley, editor Journal of Electricity and Pacific Coast editor the McGraw-Hill Electrical Trio; A. M. Perry, engineering editor, Electrical World; W. M. Deming, Pacific Coast manager McGraw-Hill Company; A. H. Halloran, McGraw-Hill Book Company; H. A. Lewis, advertising director, McGraw-Hill Company; A. T. Tregoning, circulation department, McGraw-Hill Company.

E. P. Bacon, vice-president and general manager of the Natrona Power Company of Caspar, Wyoming, was one of the representatives from the far north who helped to make the Pasadena convention truly representative of the entire nation.

D. F. Johnson, member of the Arizona Corporation Commission, was the third public utility commissioner who attended the convention. Both E. O. Edgerton, president of the California Railroad Commission, and Carl D. Jackson, president of the Wisconsin commission, gave addresses which stood out as among the most important features of convention.

Stephen E. Dillon, general manager of the Citizens Electric Company of Hot Springs, Arkansas, was one of the enthusiastic group from that city who were urging that convention be held in Arkansas next year.

W. Creighton Peat, president of the National Association of Electrical Contractors and Dealers, represented the contractor-dealers in the councils of state, while from the Electrical Jobbers' Association, the chairmen of the three sections were present: A. M. Little, eastern division, W. R. Herstein, central division, and C. C. Hillis, Pacific division.

C. E. Corrigan, vice-president of the National Metal Molding Company, Pittsburgh, and Chas. Boynton, New York representative of the company, attended the Jobbers' Convention at Del Monte, later visiting other Pacific Coast points. Mr. Corrigan's birthday occurring during the Del Monte Convention, was celebrated by a dinner dance tendered Mr. Corrigan by Mr. and Mrs. Garnett Young of the Garnett Young Company, Pacific Coast representatives of the National Metal Molding Company.

R. E. Thompson, manager of the Deming Ice and Electric Company of Deming, and C. M. Einhart of the Roswell Gas and Electric Company, both of New Mexico, were prominent among the delegates from the Southwest in all sessions.

Wm. L. Goodwin, the fruit of whose work toward co-operation in the industry was evident in so many of the activities represented at the conventions, made one of the important addresses of the Electrical Supply Jobbers' Convention at Del Monte. In order to take advantage of Mr. Goodwin's visit to this coast, joint meetings have been arranged in the principal cities of the West to hear his message of cooperation and good merchandising and have been attended by representative gatherings of men from all branches of the industry.



H. L. Aller, vice-president and general manager of the Pacific Gas & Electric Company of Phoenix, M. V. Watson, manager of the Prescott Gas and Electric Company of Prescott, W. S. Sultan, general manager of the Globe Light and Power Company of Globe, G. T. Herrington, manager of the Flagstaff Electric Light Company of Flagstaff, and R. S. Masson, vice-president of the Arizona Power Company, were among the important power company officials from Arizona who helped to make up the strong group which represented that state.

A. Monro Grier, of the Canadian Niagara Power Company, Niagara Falls, Ontario, and John R. Read, manager of the Canadian Westinghouse Company from Hamilton, Canada, represented our brothers to the north at convention sessions and brought news of electrical progress across the border.

Practically every state in the Union was represented at the big convention. The following list includes one delegate only of the many from each state:

H. C. Abell, Electric Light and Traction Company.....	New York
H. Carl Albrecht, Philadelphia Electric Company.....	Pennsylvania
E. A. Barrows, Narragansett Electric Lighting Company.....	Rhode Island
J. M. Barry, Alabama Power Company.....	Alabama
S. J. Bertron, Jr., Houston Light and Power Company.....	Texas
W. P. Beyerle, Consolidated Gas, Electric Light & Power Co.....	Maryland
H. C. Blackwell, Kansas City Power and Light Company.....	Missouri
F. E. Blake, The Hawaiian Electric Company.....	Hawaii
Geo. A. Campbell, Truckee River General Electric Company.....	Nevada
Frank R. Coates, Toledo Railways and Light Company.....	Ohio
H. A. Coles, Westinghouse Electric & Manufacturing Company.....	Georgia
George B. Leland, The Stamford Gas and Electric Company.....	Connecticut
J. G. Cronin, United Electric Company, Wichita.....	Kansas
Morse DellPlain, Northern Indiana Gas and Electric Company.....	Indiana
Frank J. Duffy, Southern Railway and Light Company.....	Mississippi
B. C. Edgar, Chattanooga Railway and Light Company.....	Tennessee
C. M. Einhart, Roswell Gas and Electric Company.....	New Mexico
Dudley Farrand, Public Service Electric Company.....	New Jersey
H. A. Fee, The Citizens Light and Power Company.....	Michigan
H. W. Fuller, Northern States Power Company.....	Minnesota
L. N. Gilbert, Zephyrhills Electric Company.....	Florida
F. D. Gordon, Androscoggin Electric Company.....	Maine
J. E. Harsh, Lincoln Gas and Electric Company.....	Nebraska
W. C. Lounsbury, Superior Water, Light and Power Company.....	Wisconsin
Alfred S. Nichols, Paducah Electric Company.....	Arkansas
Edward A. Phinney, Jefferson County Power and Light Company.....	Colorado
D. D. Price, Durham Light and Traction Company.....	North Carolina
Harry Reid, Kentucky Utilities Company.....	Kentucky
N. T. Wilcox, Mississippi River Power Company.....	Iowa
L. E. Sinclair, Potomac Electric Power Company.....	Washington, D. C.
R. W. Wilde, Desert Power and Water Company.....	Arizona
Percival Stern, Interstate Electric Company.....	Louisiana
S. R. Inch, Utah Power and Light Company.....	Utah
D. L. Huntington, Washington Water Power Company.....	Washington
Franklin T. Griffith, Portland Railway, Light and Power Co.....	Oregon
H. H. Cochrane, Montana Power Company.....	Montana
Thos. W. Neill, Kootenai Power Company.....	Idaho
E. P. Bacon, Natrona Power Company.....	Wyoming
R. H. Ballard, Southern California Edison Company.....	California

Hon. Wm. D. Stephens, Governor of California, in an address before the convention on the 19th, expressed the friendly appreciation by the state of an industry which has meant so much to the development of the West.

H. D. Hawks, general sales manager of the Anaconda Copper Mining Company, with Mrs. Hawks, came all the way from Montana to attend convention in the Southland.



## Meeting Notices for Electrical Men

(The seventh national Foreign Trade Convention and the Foreign Trade meetings of the San Francisco Electrical Development League are features of this set of meeting notices. An advance item concerning the Pacific Coast A. I. E. E. convention is included among other A. I. E. E. and A. S. M. E. news.—The Editor.)

### The National Foreign Trade Convention

The Seventh National Foreign Trade Convention which was held in the San Francisco Civic Auditorium May 12th to 15th was the greatest in history. Twenty-five hundred delegates were in attendance. The general convention theme was as follows: "The Effect of Being a Creditor Nation."

The final report of the general committee urges that as a creditor nation the United States should afford other nations every fair and reasonable opportunity to sell their products to us, especially raw materials. Full employment of manufacturing facilities was urged so that production may be increased to the maximum in order to restore normal conditions of employment and living.

Final deduction favors supplemental legislation to the Webb-Pomerene Act; the allocation of more passenger vessels to South American and trans-Pacific trade; the building of ships for export; the establishment of foreign trade zones at ports of entry; the extension of international parcel post facilities; the federal incorporation of American firms in China; the construction of additional cable facilities and the extension of radio service. The general meeting was called to order by James A. Farrell, president of the United States Steel Corporation and chairman of the National Foreign Trade Council. The chairman of the meeting was Alba B. Johnson, former president of the Baldwin Locomotive Works. O. K. Davis was secretary.

Fifteen group sessions of the various phases of world trade were considered. Representatives of forty foreign countries were present as guests and delegates. In the session on "Foreign Trade and the Press" a paper by James H. McGraw, president of the McGraw-Hill Co., Inc., was presented on "The Service of the Business Press." L. F. Gordon, editor of *Ingenieria Internacional*, was present at this session. The McGraw-Hill Company had a large display among the exhibits in the convention auditorium.

The trade adviser service with a staff of two hundred gave individual conferences to delegates. Among these advisers were E. Wilhemli Exeesten of the Robbins and Myers Company, who advised on the export of electrical goods, and M. A. Oudin, vice-president of International General Electric Company, on the same subject. W. W. Nichols of the Allis-Chalmers Company spoke on the reorganization of government service of trade promotion and information.

A luncheon of the American Manufacturers' Export Association was held in the Palace Hotel on the thirteenth of

May in connection with the convention. The banquet held in the Civic Auditorium on May fourteenth was one of the largest ever held in this country.

At the conclusion of the convention many delegates remained on the Pacific Coast to visit the many scenic regions and to investigate the industrial resources of the West.

### Foreign Trade Meeting of Electrical Development League

The regular meeting of the San Francisco Electrical Development League, held at the Palace Hotel in San Francisco on May 10th, was a Foreign Trade meeting, the chairman of the day being Mr. Aubrey Drury, the secretary of the Foreign Trade Club. In introducing Mr. W. E. Row of Fobes & Co., Shanghai, China, Mr. Drury traced the development of foreign trade in the United States, emphasizing particularly that previous to the completion of the Panama Canal there was practically no foreign trade and that it was for the World War to bring about the big awakening of America to its possibilities.

Mr. Row spoke on the development of the Far East and mentioned particularly the General Electric and Western Electric factories in China where electric globes are being manufactured, the bases being imported from the United States. Mr. Row spoke encouragingly of the possibilities of China's becoming a manufacturing country due to the great amount of cheap manual labor there.

Mr. A. R. Hagar, the next speaker, is chairman of the delegates of the American Chamber of Commerce in China to the Foreign Trade

Council. He is also president of the Ad Club in China and manager of the International Correspondence School of Asia. Mr. Hagar spoke on Foreign Trade legislation, business outlook in general and on manufacturing possibilities. He said that the future need of China is machinery and teachers, and went on to speak of the necessity of having American agents in China to represent the American manufacturing houses. Mr. Hagar also urged special legislation which would enable the federal incorporation of American firms so that concerns in this country can compete with English firms for whom special legislation benefiting trade with China has been enacted.

The meeting was well attended and there were a large number of out-of-town guests at the luncheon, due to the Foreign Trade Convention in San Francisco and also to the fact that a great number of electrical men were en route to the Jobbers' Convention at Del Monte and the N. E. L. A. Convention at Pasadena.

### BUILDERS OF THE WEST — LXXVIII



FRANKLIN T. GRIFFITH

While the commercial element of the electrical industry of the West has visualized in dollars and cents the possible returns from power plant installation, and the engineer with creative imagination has accomplished in the West during the present decade feats of construction and design equaled nowhere else in the world, the analytical mind of the lawyer has been at work on the conditions which can facilitate or retard this progress. To Franklin T. Griffith, president of the Portland Railway, Light & Power Company and chairman of the Water Power Development Committee of the National Electric Light Association, this issue of the *Journal of Electricity* is affectionately dedicated, in appreciation of his helpful thought in outlining the legislation necessary to bring about the economical and adequate development of our water power resources, and for his magnificent analysis of the ultimate public benefits inherent in this development.



**A. I. E. E.—Seattle Section**

The regular May meeting of the Seattle Section of the A. I. E. E. was held in the Chamber of Commerce assembly room on the 18th of May. Mr. H. J. Sheppard presented a paper on the subject, "Methods Used in Laying Submarine Cables." Mr. Sheppard is district plant engineer of the Pacific Telephone and Telegraph Company.

The paper was illustrated by slides which helped to set forth the methods which have been used by the author in laying long submarine cables of large diameter.

**A. S. M. E.—San Francisco Section**

The regular monthly meeting of the San Francisco Section of the American Society of Mechanical Engineers was held in the Engineers' Club on the twentieth of May. A paper on "Problems in Connection with the Commercial Development of the Aeroplane" was presented by Dr. Wm. F. Durand, who is a recognized authority on the subject. His connection with the Aircraft Development Board during the war made it possible for him to treat the subject in a most interesting manner.

**A. I. E. E. and N. E. L. A.—Portland, Oregon Sections**

The annual joint meeting of the Portland sections of the A. I. E. E. and the N. E. L. A. was held at the Auditorium University Club a short time ago. Mr. Robert G. Dieck, engineer of the Committee of Fifteen, addressed the meeting on the subject, "The Swan Island Project."

The annual election of officers of the N. E. L. A. section was held during a short business meeting which preceded the address.

**National Engineers' Convention at St. Louis**

The Sixth Annual Convention of the American Association of Engineers was held in St. Louis on May the tenth. At that time delegates representing eighteen thousand engineers considered important policies affecting the engineering profession.

**Los Angeles Engineers Elect New Officers**

The recent election of officers in the Los Angeles Chapter of the American Association of Engineers resulted in the selection of the following: A. L. Harris, president; H. Z. Osborne, Jr., vice-president; R. H. Holbrook, secretary; W. D. Armstrong, Myron Hunt, F. C. McMillan and F. H. Olmsted, directors.

**San Francisco Electrical Development League**

"Ye Old Tyme Meeting" of the San Francisco Electrical Development League, which was held at the Palace Hotel, San Francisco, May third, was a great success. Henry Bostwick, manager San Francisco district, San Francisco Gas & Electric Company, was chairman of the day and due to the example set by him the meeting was unusually full of spirit. During the course of the meal Max Breakhill and John Gilbert of the Pacific Gas & Electric Company, accompanied by Oscar Young, entertained the members with songs. There were also several selections on the accordion.

One feature of the day was the introduction of the "League Twins," which had been kept as a mystery. Mr. Bostwick introduced Mr. Garnett Young as Mr. Sam Wiggins and vice versa. This caused a lot of fun as each told the life history of the other. The second twins proved to be Mr. Lee H. Newbert and Mr. R. M. Alvord, who held a "mutual admiration society" meeting instead of following the satirical mood of the other pair. In the prize roll call Mr. Arthur Dahl, of the Charles W. Dahl and Son Electric Company, won the prize for the snappiest announcement.

**Advisory Committee Meeting, California Cooperative Campaign**

At the meeting of the Advisory Committee of the California Cooperative Campaign at Visalia, on April 23, Secretary H. W. Angus was instructed to assist Mr. B. F. Pearson of the Southern California Edison Company as a member of the publicity committee of the N. E. L. A. convention. It was decided that the campaign would have an exhibit at the

**THE GOODWIN-CHASE MEETING**

Meeting of three hundred and fifty electrical men held recently in the San Francisco Commercial Club under the auspices of the California Electrical Cooperative Campaign. A complete account of this meeting was given in the May 1st issue of the Journal of Electricity among the Meeting Notices for Electrical Men. The banquet hall was decorated with cards exalting the cooperative idea and welcoming "Bill" Goodwin, who has done more than any other man in the electrical industry to make this idea a working basis for all members of the industry in this country. Speeches were given by A. Emory Wishon, Harry Kirkland, Samuel Adams Chase and W. L. Goodwin.



N. E. L. A. convention which would be self-explanatory and show the various activities of the campaign and the results obtained. Plans were made to give more publicity to the convenience outlet campaign by the distribution of plans of Electrical Home No. 2 among the trade and central stations, and the distribution of the N. E. L. A. booklet "Comforts and Conveniences of Electricity in Your Home." The next meeting of the Advisory Committee was set for June 11th and 12th at San Francisco.

#### A. I. E. E.—Pacific Coast Convention

The ninth annual Pacific Coast Convention of the American Institute of Electrical Engineers will be held in Portland, Oregon, July 21-23, 1920, under the auspices of the Portland Section.

The program is not complete as yet but details as to the papers, authors and entertainment features will be ready for publication by the middle of this month.

Upon recommendation of the Portland Section officers and Vice-President Fisk, the following Pacific Coast Convention Committee has been appointed by President Townley: R. M. Boykin, chairman, O. B. Coldwell, Wm. J. Cottrell, R. L. Elder, L. G. Fear, Lee W. Going, W. C. Heston, W. F. Hynes, A. H. Krue, R. F. Monges, A. S. Moody, C. P. Osborne, E. D. Searing, W. S. Turner, Carl L. Wernicke, E. F. Whitney, J. E. Yates, all of Portland; and the following chairmen of other sections—H. S. Evans, Denver; Markham Cheever, Salt Lake City; Clem A. Copeland, Los Angeles; R. F. Hayward, Vancouver; G. E. Quinan, Seattle; J. E. E. Royer, Spokane; W. G. Vincent, San Francisco.

#### Annual Meeting and Edison Medal Presentation

The annual business meeting of the A. I. E. E. was held May 21st in the auditorium of the Engineering Societies Building, New York. At this meeting the board of directors made its annual report, including a financial statement for the year ending April 30, 1920. The report of the Tellers was also presented, giving the results of the election of officers for the ensuing administrative year.

Immediately following the business meeting the ceremony of the presentation of the Edison Medal took place. This medal was founded by the Edison Medal Association, composed of associates and friends of Mr. Thomas E. Edison, and is awarded annually by the American Institute of Electrical Engineers "For Meritorious Achievement in Electrical Science, Electrical Engineering, or the Electrical Arts."

The Edison Medal has been awarded this year to Mr. W. L. R. Emmet "For Inventions and Developments of Electrical Apparatus and Prime Movers," and the presentation ceremonies were as follows:

1. "The Edison Medal," by Carl Hering, chairman, Edison Medal Committee.
2. "Achievements of W. L. R. Emmet," by H. W. Buck.
3. Presentation of the Medal, by Calvert Townley, president, American Institute of Electrical Engineers.
4. Response, by W. L. R. Emmet.

Mr. Emmet is the inventor of several types of transformers, including a form of air-blast type; of several types of insulation of alternators, and of the oil switch. After experimentally investigating the possibilities at Brooklyn and Niagara Falls, the heaviest circuits then existing, he was the first to design and use switches of this type. The varnished cambric cable is also an Emmet invention. He is also the inventor of the vertical shaft steam turbine. Mr. Emmet's achievements have been those of an engineer and a pioneer of new methods rather than those of an inventor and much of his original and most useful work could not be effectively patented, nor perhaps even classified as invention.

His principal employment has been with the Sprague Electric and Motor Company and the General Electric Company.



#### THE ELECTRICAL CREDIT ASSOCIATION

Picture of the banquet held in connection with the fifteenth annual meeting of the Electrical Credit Association of the Pacific Coast, which took place recently in San Francisco. Several interesting speeches and committee reports were given and the annual election of officers took place. R. J. Holtermann, manager of the Holabird Electric Company, was elected the new president. A complete account of the meeting was given in the May 1st issue of the Journal of Electricity among the Meeting Notices for Electrical Men.

#### WORLD METRIC STANDARDIZATION CONFERENCE

A World Metric Standardization Conference was held in San Francisco on the 17th of May for the purpose of joining into concerted action the support behind the movement to get weights and measures in English-speaking countries standardized on the metric basis. This conference was called by the American Metric Association, the Manchester and London Decimal Association and the World Trade Club of San Francisco, in cooperation with the American Institute of Architects, the American Chemical Society, The Washington State Manufacturers' Association and similar organizations that urge metric adoption.

This Conference was the outcome of a campaign to get legislation providing for the gradual adoption of the metric units as exclusive measurements in the United States and Great Britain. Up to this time 60 Chambers of Commerce have adopted resolutions endorsing the campaign and statements of support have been formally voted by the American Institute of Electrical Engineers, Western Association of Electrical Inspectors, American Society for the Advancement of Science, National American Scale Men's Association, and many other like societies.

Rear-Admiral J. L. Jayne, commandant of the Twelfth Naval District, and Colonel Thomas H. Rees, representing General Liggett, were among the principal speakers at the general meeting. John J. Arnold, National Foreign Trade Councillor and Supervisor of the International Business Department of the Bank of Italy, acted as chairman.

Mr. B. Darrow of the Technical Department of the Goodyear Rubber Company explained why that company had decided to equip and operate its new Los Angeles plant entirely on the metric basis. Mr. C. M. Lewis, secretary of the Manufacturers' Association of Washington, also spoke.

Among those who sent special messages to the conference were Luther Burbank, Wm. G. McAdoo, General Pershing, Franklin K. Lane, Alexander Graham Bell, Thomas A. Edison, Henry Ford and James Speyer.

In connection with the article, "Hydroelectric Development in Southern California," by W. A. Brackenridge, which appeared in the May 15th issue of the Journal of Electricity, credit is due I. H. Lecklider, assistant electrical and mechanical engineer of the Southern California Edison Company, for the valuable work done by him in connection with its preparation.



## HAPPENINGS IN THE INDUSTRY

### PACIFIC GAS AND ELECTRIC COMPANY'S CONSTRUCTION PLANS

In a statement before the Railroad Commission, John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, said that in the next eleven years the company would spend \$123,000,000 in development of the Pit River project. Of this \$63,000,000 will be spent on the hydroelectric project and \$60,000,000 in substations and transmission lines. Mr. Britton also stated that he expected the eleven years would add 450,000 customers to the company's list, basing this estimate on the fact that in the last eight years the company had given service to 250,000. The first two units of the Pit River development are now under way. These consist of two separate installations of 12,500 kw. each on Hat Creek, which is the most important tributary of Pit River.

The machinery for the construction work is now being hauled from the company's tunnel site at Big Bend on the Pit River to the Hat Creek power house site. The majority of the current generated by these two plants will be available by the beginning of this winter and these two power houses will generate most of the energy used in the rest of the Pit river development construction work.

The water rights purchased on the Pit River from the Mt. Shasta Power Company, Northern California Power Company, and the Red River Lumber Company have cost the Pacific Gas & Electric Company \$1,250,000. The plans for the construction of the ten hydroelectric plants on this river will make available 400,000 hp. The plans of the company call for the securing of \$10,000,000 new capital each year. Mr. Britton estimated that the units would be completed and new power delivered as follows: In 1921, 60,000 hp.; in 1923, 44,000 hp.; in 1925, 60,000 hp.; in 1927, 57,000 hp., and in 1930, 79,000 hp.

The case in hearing before the Railroad Commission at the present time is for an increase in rates for electricity to all consumers. Application was made for permission to place a surcharge on all bills, pending the final determination of the rates the company will be permitted to charge. W. G. Vincent, valuation engineer of the company, submitted estimates calculated to show that present rates would produce a deficit of \$2,334,380 on the estimated business of the company during 1920. He estimated that the 1920 revenue at the present rate would be \$19,455,528 and that the total expenses would be \$12,808,431, leaving \$6,047,097 for return on investment, which he said was \$1,893,279 less than the return allowed by the Commission on the rate basis of properties. Mr. Downing, vice-president, in charge of electrical operation and maintenance, estimated the output of all of the plants for 1920 at 1,411,514,990 kilowatt-hours, divided as follows: from hydroelectric plants, 695,911,664; steam plants, 610,899,010 and by purchase from other companies, 104,704,315 kilowatt-hours. Because of the water shortage, he estimated that the fourteen steam plants of the company would necessarily be run at capacity load with an expenditure of \$5,127,050 for oil. Downing submitted an estimate of \$2,028,444 for maintenance account of 1920.

### VALUATION OF SIERRA AND SAN FRANCISCO POWER COMPANY

In a hearing before the Railroad Commission of California to fix rates for electricity and water for the Sierra and San Francisco Power Company, the Railroad Commission's engineers submitted their appraisal at the value of the

physical property of the company. According to the engineers' report it would cost \$11,846,236.64 to reproduce anew the company's plant. The segregation of the value of the properties was as follows: electric, \$11,234,639.64; water properties, \$413,024; non-operative property, \$187,673. This estimate was made on December 31, 1919. The depreciated value of the operative property, both water and electric, was estimated at \$9,379,637.79. The Sierra and San Francisco Power Company is now a part of the system of the Pacific Gas & Electric Company, having recently been taken over under a fifteen-year lease.

### EXTENSION COURSES IN ELECTRICITY

Two courses in electricity, of 15 lessons each, have been prepared by the Technical Department of the University of California Extension Division which aim to give instruction in electricity to persons who have no knowledge of the subject and to those who have a good practical idea of the craft but desire technical training and theoretical instruction that they may advance faster in their work.

These courses make it possible for an engineer in a remote Sierra generating plant; a lineman patrolling a far-flung transmission line; a substation operator; a radio operator ashore or at sea; or a salesman who handles electrical goods, to acquire knowledge and training while staying at his work. Correspondence lessons are sent from Berkeley to all parts of the state, and even to all parts of the world where there is a post office.

The two correspondence courses in electricity have just been revised by the Extension Division instructors. The lessons include a set of problems to be solved. The students' papers are corrected by the instructors and are returned with answer sheets and supplementary instructions. The two courses given cover respectively direct currents and alternating currents.

### SOUTHERN CALIFORNIA EDISON COMPANY BOND ISSUE

The Southern California Edison Company has been given permission by the Railroad Commission of California to issue \$5,000,000 in general and refunding mortgage 6% bonds. The purpose of this new issue of bonds is to provide money for the completion of a plant, the total capacity of which is 63,000 hp., now under construction on Big Creek on which the company plans to spend a total of \$8,500,000 during the remainder of this year. In granting the application of the company for bonds the Railroad Commission stated: "The applicant's evidence shows that it has definite plans for the development of both water and steam power projects to meet its requirements for at least eight years in the future and at an estimated cost of \$100,000,000. The Southern California Edison Company's water rights on Kern river, upper San Joaquin river and Big Creek are capable of developing a total of 900,000 hp."

### POWER ADMINISTRATOR ASKS CO-OPERATION OF INDUSTRIES

Warning large users of power that the deficient rainfall of this year and the large increase in the use of electricity will result in a serious power shortage during the summer, State Power Administrator H. G. Butler has sent out more than a score of letters urging conservation of power. The letters were sent to all gold dredgers and cement mills operat-



ing in northern California, interurban car lines, both north and south, and the street railroads of the northern cities. In his letter Butler said:

"The most important single thing that can be done to minimize this shortage is to make the demand on the power companies as uniform as possible during the week and during the 24 hours of the day, as a uniform load enables these companies to operate their steam plants to full capacity all the time, thus making more power available to consumers.

"The extent to which restrictions will become necessary later will depend, to a large extent, on the success of consumers in reducing their normal consumption. It is probable, however, that some restrictions will be necessary later in the season and plans should be prepared so a material reduction can be made in your load then with a minimum of inconvenience to your patrons and yourselves."

As a means of conserving power Butler suggested to the interurban roads that they should arrange, as far as they can, to run their freight trains and do their switching during the night hours after the middle of May.

The gold dredgers and cement mills were also urged to make their heaviest demands for power "come during the night hours after the middle of May."

### WESTERN MANUFACTURE OF RADIO EQUIPMENT

The result which the war has had upon the increased manufacture of electrical equipment in the West is well illustrated by the story of the Kilbourne and Clark Manufacturing Company of Seattle, Washington.

This company was organized some thirteen years ago for the manufacture of radio telegraph apparatus, and due



Picture showing the navy equipment in the assembly department of the Kilbourne and Clark Company, western manufacturers of radio equipment. This organization is now under contract to equip approximately five hundred shipping board vessels, as well as several shipping vessels for private interests.

to the production of a material portion of the large number of radio sets required during the war, now holds a place as one of the largest producers of wireless telegraph apparatus in the whole country. A great deal of research work looking to the simplification of a design and improvement in the mechanical construction of radio apparatus has been done, and as a result the company has been able to greatly improve this class of apparatus.

At the present time the company maintains as a subsidiary organization the Ship Owner's Radio Service, Inc., the purpose of this organization being to contract with ship owners for the handling of their accounts, furnishing them with all radio forms, recommending and hiring experienced operators, inspecting apparatus, and doing all necessary repair work. The organization is under contract to furnish this service to approximately five hundred shipping board vessels as well as to a large number of private shipping interests. For this purpose, thirteen service stations in the United States and one in Honolulu are maintained.

### ELECTRIC SHOWS AND EXHIBITS REGULATED

As interest in electric shows and exhibits increases it is hard for individual manufacturers to determine the merits of the various shows at which they are asked to exhibit. And so, at the request of the Electric Power Club, a committee was appointed some time ago by the Electrical Manufac-

turers Council to give careful consideration to the entire subject.

Recommendations have been adopted by the Council, based on the report of its committee, and are as follows:

1. For the fullest cooperation, it is strongly recommended that exhibitors as a whole shall have representation in the management of the show equal to that of the local management.
2. Class and nature of exhibits shall be determined by the show management. Concessions for sale of knickknacks, candy, toys, etc., shall be prohibited as they detract from the educational value of exhibits.
3. Souvenirs represent waste and extravagance of a character which the industry is trying to prevent. They are not beneficial in promoting the main educational object of shows. Their distribution at shows shall therefore be prohibited.
4. Exhibitors shall not be asked to give financial support through advertisements or in any other way to programs and catalogues. These, if issued, shall not contain any advertisements.
5. Passes shall be issued to officers, official representatives and attendants of companies exhibiting, the number to be based equitably on the space occupied.
6. Exhibitors may have trade tickets at one-half the regular admission price, settlement to be made on the basis of the tickets actually turned in at the gate.
7. The show management shall strive to make the character of the exhibit such as will reflect credit upon the electrical industry and at the same time keep the expense within reasonable limits. Any surplus after payment of legitimate expenses shall be returned to exhibitors in proportion to the amount of space used.
8. The show management shall have the right to discontinue and remove any exhibit which in its opinion is objectionable to exhibitors, the public or the industry.
9. For the amount paid for space the show management will provide the following service to exhibitors:  
Insurance against fire and theft.  
Watchman day and night.  
Clean aisles and thoroughfare (not including exhibits).  
Store boxes and other containers in good order and at the proper time deliver them promptly to exhibitors for return shipment.
10. It is recommended that, before contracting for space or otherwise committing themselves to participate in an electric show or exhibit, all electrical manufacturers ascertain from the Secretary of the Electrical Manufacturers Council if the management thereof has adopted the foregoing recommendations.

The Committee of the Electrical Manufacturers Council which considered the subject has been continued as a standing committee to which matters in reference to electric shows and exhibits may be referred.

### ATTACHMENT PLUG DECISION

Word has been received that the Circuit Court of Appeals for the Southern District of New York has rendered a decision that Standard Attachment Plugs as made by the Bryant Electric Company and General Electric Company do not infringe Hubbell patents. This decision will be reviewed more fully in our next issue.

### OIL FIELD RATES INCREASED

Oil Field electric service in the territory supplied by the Midland Counties Public Service Corporation will cost more in the future. The Railroad Commission having authorized the Midland company to increase its rate for that service on and after May 23, the company's rate to the oil fields will be 1.4c. per kw-hr., the same rate that is now being charged for a similar service in the territory supplied by the San Joaquin Light & Power Corporation. Its service covers certain portions of Fresno, Monterey, San Luis Obispo and Santa Barbara counties. Approximately 55% of the company's sale of electricity is to oil field consumers, who according to exhibits submitted at the hearing of the case, have been getting the energy for less than its cost to the Midland company.

### CONTRACTORS ADOPT CODE

The General Contractors Association of San Francisco, has adopted a code of working rules which are to govern its members in connection with the submission of proposals for private work on and after April 1, 1920.

These rules are the result of painstaking labor extending over many months, involving conferences with architects and engineers. It has been sought to establish a uniform, equitable basis for governing the work of contractors prior to



signing of the contract, as the standard forms of contracts tend to govern it thereafter.

In brief the fourteen rules which comprise the code are as follows:

1. All competitive proposals for a specific job will be based on uniform conditions, the same for all bidders. Each contractor invited to bid shall be supplied without charge with a complete set of plans and specifications, governing the work he has been invited to bid on, and shall have the exclusive use of same until the time set for opening bids.
2. Indistinct items and plans drawn to a scale less than one-eighth ( $\frac{1}{8}$ ) inch to the foot will not be figured.
3. In order to avoid waste of time and cost of useless estimates, it is desirable that architects state with each call for bids the cost estimate on which the plans are based.
4. Proposals may be submitted in the form of a lump sum for the entire work, or in the form of lump sums for one or more sub-divisions of the work, or on the basis of actual cost plus a percentage or fee, as called for by the owner, or his agent; but, unless bidders are furnished free of charge with a complete schedule of quantities, competitive proposals will not be submitted on more than one basis for a given job, nor will any proposal at all be submitted on a job on which proposals are requested on more than one basis; nor will proposals be made on plans on which other proposals have been tendered by a member or members of this or allied associations within the past three months; provided, however, that if within said period of time it appear that all bidders have withdrawn their proposals, in such case the owner or his agent may call for new bids regardless of the time limit hereby established.
5. Each proposal will be submitted to the owner or his agent sealed and marked on the outside with name and location of job, name of architect, time and place where bids are to be opened, and name and address of the bidder.
6. All proposals will be opened and read by the owner or his agent at the same prearranged time and place, in the presence and hearing of such bidders or their representatives as care to attend.
7. The fact that a contractor's bid has been received and opened by or for an owner is prima facie evidence that he is deemed competent and desirable by the owner. If work goes ahead with no greater modification in original plan than five per cent (5%) of his bid, the contract will be awarded to the lowest bidder. If the owner desire further to modify the cost of the work he will alter the plans and specifications accordingly and if the changes amount to no more than fifteen per cent (15%) of the lowest bid, the lowest three bidders only will figure the changes, with the understanding that the lowest bidder of the three will be awarded the job.

If the specified modifications amount to more than fifteen per cent (15%) of the original low bid, the owner will revise the plans and specifications accordingly and may call for bids as provided above for a new set of plans.

Modifications and alterations provided for herein are understood to include only bona fide changes in the work covered by the original bids and accepting correspondingly the cost of the building as a complete structure. Revised segregations of necessary elements of the complete structure, whereby portions of the work are merely added to or omitted from the general contract as originally described, will not be deemed bona fide changes with respect to the rights of the original bidders as hereinabove determined.

8. Bidders will not segregate nor itemize a proposal out of conformity with the terms of the call for bids, nor quote unit prices other than for excavation, pile driving, foundations, and structural and reinforcing steel, prior to award of contract.

Bidders will not submit more than one original and one alternate proposal on the whole or any single sub-division of the work.

9. The standard Contract "Form A" as heretofore published by the General Contractors Association, Inc., of San Francisco, shall be considered as embodying basic conditions under which lump-sum proposals are submitted; and where no other definite form of contract accompanies the specifications, said "Form A" shall be used to govern all work where applicable.

10. Where competitive proposals are called for in conformity with these rules, members are prohibited from participating in pools or other agreements whereby bona fide competition will be denied the owner.

11. Members are prohibited from submitting proposals to owners or agents unless invited to do so. This shall not be construed to deter members from soliciting business on legitimate lines.

12. Members are prohibited from disclosing to anyone, prior to acceptance of same, a material-man's estimate or quotation of a specialty contractor's bid.

13. Before negotiating with an owner or agent regarding a project involving on the contractor's part the submission of an estimate of cost, a member will first ascertain from his association that there are no similar negotiations pending on the same project involving members of his or allied associations. On actually opening bona fide negotiations, a member will forthwith notify the association, giving name and address of owner and location and character of the project. During the progress of negotiations, at intervals of not more than one month, the member will advise his association in writing as to the status of the case, and will report in writing to his association immediately either the breaking off of negotiations or the securing of the job.

Notice from owner or agent that negotiations have been abandoned with respect to any member will operate to clear the project.

14. Special cases wherein any of the foregoing rules appear to be inapplicable or to work unwarranted hardship, may be referred to the association and special consideration will be given same.

## RECLAMATION DISTRICT TO BUILD POWER HOUSE

On account of the power shortage the rice growers in Reclamation District No. 108 have decided to install a power house of their own so that they will be independent of the power companies and can plant as much rice as they want and be assured of sufficient power to pump the necessary

water. Twenty thousand acres of rice will be planted this year instead of seven thousand as of last year. The power house will be located at Knight's landing and is to cost \$80,000. The plant is to be steam driven and will generate 1300 hp, the energy being delivered over the distribution system of the Pacific Gas & Electric Company.

## RECENT RATE INCREASES

Three of the largest power companies in California have applied to the Railroad Commission of that state for rate increases and at the present time, one of them, the Southern California Edison Company, has been granted an increase of 2.16 cents per kilowatt hour to the ordinary consumer. This will insure the company a seven per cent return on its investment, and the increases allowed through the scale of rates will average 27 per cent. These new rates are temporary and will be in effect from April 20th until the end of the year.

The recent advance in the price of oil, which amounts to twenty-five cents per barrel, will increase the operating costs of the Southern California Edison \$436,000 and the Pacific Gas & Electric Company claim that the increase in the price of oil will call for an expenditure by the company of \$1,600,000 in excess of the cost of fuel oil used in its steam plants in 1919. The increase will add not less than \$750,000 to the operating expenses of the Great Western Power Company.

In granting the increase of rates to the Southern California Edison Company, Mr. E. O. Edgerton, president of the Commission, said in part:

"It is vitally necessary for the continued growth and prosperity of the vast territory in Southern California supplied by the applicant with electric energy, that its full program of development go forward without serious interruption. I believe it to be in the interest of consumers that they pay rates sufficiently reasonable to enable the company to earn a fair and reasonable return upon the actual investment. Unless this is done, it is plain that the utility cannot borrow sufficient funds to carry forward necessary developments. It is of great importance that this program of development go forward. Should there be any halt in this program it is evident that tremendous losses will result to the whole community if sufficient electric energy is not developed to meet the growing demands.

"Of course, it is not to be understood that the Railroad Commission urges the payment of unreasonable rates to stimulate investment in this public utility, but when it is considered that to place this company in a position where it can successfully finance, will not result at this time in even an 8 per cent return on investment it will at once be realized that the burden upon the consumer is not unreasonable.

In considering the granting of an increase in rates of the amount contemplated, I am especially mindful of the fact that the company has been diligently active in the enlarging of its production and transmission facilities since the consolidation of the properties in 1917; it has shown an active determination to carry on development, and, from the evidence presented, has exerted every reasonable effort to meet the demands of the territory served in the face of the difficulties arising from the war period of 1918 and the need of readjustment and high costs of money, material and labor which have continued since. The company's evidence shows that it has definite plans for the development of both water and steam power projects to meet its requirements for at least eight years in the future at an estimated cost of \$100,000,000."

## LETTER SENT TO POWER COMPANY CONSUMERS

In a petition to the Public Utilities Commission of Idaho, the Idaho Power Company has asked for permission to raise its irrigation rates approximately thirty per cent. Since 1916 the company has been serving its customers under a rate known as a "Development Rate" which at the time it was granted was understood by all concerned to be a temporary expedient only.

Since that time all of the items entering into the cost of service have increased more than 60 per cent and in a letter to each of its irrigation consumers the company has gone into considerable detail regarding cost of production, depreciation and plans for construction in the immediate future. In 1919 the company received \$337,459.00 from irrigation customers, and for this this business alone expended \$230,646.00 in operating expenses and taxes besides \$332,500.00 on investment costs, including depreciation and interest. This deficit of \$225,687.00 divided among the consumers means that for every dollar spent by the company, it received sixty cents from the consumer.



Having taken the consumer into its confidence, the company in its letter made a plea for fair play. Part of the letter read as follows:

"We are of the opinion that the fundamental industry of Southern Idaho is irrigation and that everything that can possibly be done to lighten the burden of irrigation costs should be done, and, consequently, in apportioning our investment and our operating costs we have, in every possible way, favored the irrigation business in such apportionment. On the other hand, we do not believe that our irrigation customers desire to have service continued at a loss to the company serving them, as they well realize that, if this section of the country is to be prosperous, all concerns doing business in this territory on a legitimate basis should receive at least their costs of doing business.

"On January 9, 1920, we filed with the Public Utilities Commission of Idaho an application for a new set of rates to apply to our irrigation business during the irrigation season of 1920. Our actual conditions, as set forth in this petition, show that our deficit from irrigation business in 1919 was \$225,549.00; that, if the rates effective in 1919 apply in 1920, our deficit from this business will be \$309,382.00, and in 1921, if the rates effective in 1919 apply, \$363,581.00, and we have asked the Commission to allow us to increase our rates.

"In case these rates are adopted for our irrigation service, our earnings from these rates, after paying operating expenses and providing the funds necessary to keep the property in good condition, will provide less than 6 per cent on the money invested to serve our irrigation customers, although we are paying a considerably higher rate of interest than this for our money.

"The Public Utilities Commission have advised us that, before taking any action on this matter, they desired to have the whole problem carefully studied, not only by themselves and their experts, but also by all of the customers affected. We, likewise, are very anxious to have every one of our customers appreciate the actual conditions under which we are serving them, and the costs incident thereto so that, when the rates are finally determined by the Commission, our irrigation customers will fully appreciate that we will receive, if the rates asked for in our petition are approved by the Commission, less than our costs for the service, and will not make the small profit out of our irrigation business which all utilities are allowed by law to make on all of their business.

"We desire you to give this matter very careful study and will appreciate receiving from you suggestions, criticisms or questions in connection with this situation."

### TRADE NOTES

#### Manufacturers of Farm Machinery —

The H. V. Carter Motor Co. have moved from Van Ness Avenue to 52-58 Beale Street. Having recently added the Allis-Chalmers tractors to their rapidly growing business in farm power machinery, necessitated larger quarters for further expansion of both equipment and organization. About three years ago this company began the manufacturing of farm tractors, and D. P. King, their erecting engineer in San Francisco, was called to the factory to assist in this development. The Carter Co. requested the factory to send them the best tractor expert they could find, and Mr. King was chosen and now occupies a desk in the Beale St. office and is being welcomed back to the coast by his host of friends in the electrical industry.

#### Company Elects President —

At a recent meeting of the board of directors of The Wellman-Seaver-Morgan Company, Mr. John A. Penton, president of The Penton Publishing Company, was elected a director to fill the vacancy on the board caused by the death of Mr. Samuel T. Wellman.

Mr. Penton's intimate knowledge of the iron and steel trade, his wide acquaintanceship with prominent people in all lines of industry in this and many foreign countries, and his keen insight into business matters will make him a valued co-worker in the affairs of the company.

#### Appointment Made —

The Roller-Smith Company, 233 Broadway, New York, announce the appointment of Mr. F. R. Ryan as district manager of its Chicago office located at 739-40 Monadnock Block. Mr. Ryan has been connected with the Roller-Smith Company's office since January, 1919, in the capacity of sales engineer and his promotion to district manager was made recently.

#### Consolidation of Offices —

Announcement is made of the consolidation of the executive and sales offices of The Booth Electric Furnace Co., of Chicago, at the same address as the engineering and production office, which has been located at 326 West Madison St. Since May 1st the address of the general offices of the company have been at this address, where adequate office space

and facilities have been secured to take care of all departments.

The company announces that the sales of the rotating brass furnace have been secured rapidly since this type of equipment was placed on the market last fall. The design of the various size furnaces has been standardized, and the shop of the company is now working on a production basis, with adequate facilities for turning out furnaces in from six to eight weeks' time from date of order.

#### New Headquarters —

The city sales department of the Peerless Light Company, needing more room than was afforded them at 174 West Randolph Street, Chicago, are now located in the new Peerless Building, corner of West Washington Boulevard and Union Street. Mr. Lester Henshell is in charge of this department.

#### New Location and Department —

The Stuart Products Corporation, manufacturers of Make-UR-Own Batteries, have outgrown the capacity of their former location at 440 South Green Street, Chicago, and are now located at 665 West Washington Boulevard. To more effectively serve the interests of their trade, a sales promotion department has been organized by this company to co-operate with their jobbers and dealers.

#### Sales Department Head —

Mr. Lyle Stockton Abbott now heads the Eastern sales department of the Celite Products Company, manufacturers of Sil-O-Cel Insulating Products, at 11 Broadway, New York. Mr. Abbott succeeds Mr. H. A. Mannshardt who recently resigned.

#### Vacuum Cleaner Business Increasing —

The Electric Vacuum Cleaner Company, Inc., of Cleveland, Ohio, maintains a warehouse and service station at 315 Mason Street, San Francisco, Cal., in order to render the maximum of assistance to its Pacific Coast distributors and dealers in the sales of Premier vacuum cleaners.

The distribution of this product on the Pacific Coast has grown in a short time from insignificant beginnings to large proportions, and the idea of the company has always been to give its Pacific Coast trade the most efficient service, and to warehouse an adequate stock on the Coast for immediate shipments. Its distributors in addition to stocking the cleaner, have also themselves carried a supply of parts for all models.

The company this spring has launched a national advertising campaign in the Post and Woman's Journals. New circular matter has been provided, and attractive window cut-outs of six colors, five panels, for window displays are now in preparation.

#### Representative Sent to Japan —

I. F. Baker of the Westinghouse Electrical International Company, who has been located in the New York office of that company for the past two years, is now located in Tokyo, Japan, where he will act as a special representative of the Westinghouse International Company.

Mr. Baker entered the Graduate Student Course about 1908, later serving in various capacities in the Resale and Contract Sections of the Sales Department. In 1913 he was transferred to the Foreign Department which later became the Westinghouse Electric International Company.





## PACIFIC COAST SECTION, N. E. L. A. CONVENTION

(Continued from page 559)

tion were realized by the men in the industry, and that this idea must be sold to the industrial plants by the contractor-dealers and salesmen. Mr. Kimball requested that the paper and discussion would not close the subject, but that the work be carried on, on account of the fact that all branches of the industry would receive the benefit of all such work. He suggested that the best possible way to carry on the promotion of this work was through the local associations of contractor-dealers and the field men of the Cooperative Campaign.

In speaking of the new lighting safety orders, Mr. Kimball said that the law only covered the necessary minimum, and that this fact should be impressed upon all industrial plants, with the plea that while they were conforming to the law, they might better make the illumination of their shops as nearly perfect as possible.

R. E. Fisher, of the Pacific Gas & Electric Company, then discussed the paper, giving the viewpoint of the central station. Mr. Fisher brought out the fact that efficient lighting marks the progress of civilization, and that to a great majority of the public, the central station was still the lighting company, regardless of the fact that the power supplied by the central station may be its principal source of revenue and business. Therefore, the central station will always be held responsible for illumination, whether it be good or bad, and it is a growing responsibility that the central station must accept. The responsibility has been shifted from one branch of the industry to the other, but, said Mr. Fisher, "It is the duty of the central station to keep in touch with the new scientific developments of the art of illumination, for it has been well said that the commodity which the company sell is light rather than current."

Mr. Fisher closed by suggesting that all central stations carefully survey the lighting of all large industrial plants on their system with a view to assisting them toward better illumination, thereby performing a real service to their consumers.

In closing the discussion on "Illumination," F. D. Fagan brought out the fact that the contractor-dealer has accepted the work done heretofore by the central station regarding the lighting of the home and the industrial plant. The money expended by the contractor-dealer in wiring a home or factory so that it is properly illuminated, goes back through all of the branches of the industry who receive their pro rata share, and gives a satisfied customer, not only to the central station, but one who will boost for the industry. Mr. Fagan brought out the fact that the lamp manufacturers have failed in selling lamps instead of lighting, since the service from the lamp is what the consumer pays for.

According to figures from the Industrial Accident Commission, fifty per cent of the industrial plants are under-lighted, and Mr. Fagan pointed out that the factories could have twice as much light as provided for in the laws and still not be over-lighted.

At the close of the discussion of this paper, D. E. Harris of the Pacific States Electric Company made the statement that he thought ten per cent of the industrial plants were properly illuminated, and said that he based his figure on researches that had been carried on.

### Storage of Water at Higher Elevations

— In discussing the paper on "Storage of Water at Higher Elevations," E. B. Walthall brought out the fact that there were vast areas of potential valley land in the state of California that only require water for their development, and that the need of the nation for agricultural products is going to become a greater and greater problem each year. Therefore, he said, the central stations should consider this possible irrigation load in developing power and not allow the fact that steam stations can be erected and operated more cheaply than hydroelectric stations to influence them unduly.

A. B. West of the Southern Sierras Power Company stated that the first consideration is that of the relative costs of steam and hydroelectric stations, and that the great danger lies in the assuming of the costs of these plants. He pointed out that the factors entering into hydroelectric plants are dependable, which is not the case in the steam plant, and as an example pointed out the cost of fuel oil, which in the last five years has increased from 60 cents a barrel in the field to \$2.00, and further that no one cares to predict what the cost would be five years from now.

Another point was plant efficiency expressed in kilowatt-hours per barrel of oil. He stated that most of the electrical engineers intentionally or unintentionally underestimated this cost. The highest efficiency of the plant is at the time of installation and the small depreciation and maintenance charges at the start rapidly increase as time goes on.

W. M. Shepard, of the California-Oregon Power Company, in discussing Mr. Walthall's paper, stated that the greatest precipitation in California is, generally speaking, in the mountains, and that necessarily most of the suitable reservoir sites are located there.

"To a very large extent," he said, "stored water will perform two functions: the generation of hydroelectric power, and the irrigation of lands lying in the great California valleys needing irrigation."

"The activities of several California power companies in creating storage reservoirs have already resulted in augmenting the natural flow of some of the principal streams during the irrigation season, thereby making available more water for irrigation, and making it possible to bring more land under cultivation than would otherwise be the case."

"The typical load curves shown by Mr. Walthall illustrate the pronounced summer kilowatt-hour peak which in recent years has developed on practically all of the power systems of central and northern California, and it is to be noted that this high kilowatt-hour demand covers the period of minimum stream flow, thus accentuating the need for stored water and the necessity for auxiliary steam power."

H. J. Kister, assistant general manager of the Los Angeles Gas & Electric Corporation, read a paper which brought out, in the main, that there was no such thing as the 100 per cent saturation point in any industrial line, and that consequently there is always an opportunity to increase the sales of cur-



rent and appliances. To illustrate his point, Mr. Kister pointed out the fact that while many garages are practically completely electrified, there is nevertheless room for the sale of such goods as an oil filter, due to the increased cost of lubricating oils.

In closing he stated that if a research man should be appointed to tabulate information tending to show increased possibilities, such information as he would gather would be of inestimable value to the manufacturer, the contractor, the dealer, and the central station.

R. A. Balzari, of the Westinghouse Electric & Manufacturing Company, said that the manufacturer's viewpoint was a purely selfish one, and that a research such as mentioned by Mr. Kister would be of inestimable value to the manufacturer, allowing him to stock up in the various localities where there may be a demand for a particular appliance.

H. H. Courtright of the Valley Electrical Supply Company of Fresno spoke from the viewpoint of the contractor-dealer, and said that he is probably closer to the consumer than men in any other branch of the industry. Mr. Courtright urged the contractor-dealers to give 100 per cent service to their customers, and stated that an excellent way to sell central station securities would be for the California Co-operative Campaign to furnish the contractor-dealer with necessary data.

In closing, J. O. Case stated that the whole thing is merely a question of self-interest, and that a question of interest to all branches of the industry should be solved by all branches.

#### Engines versus Central Station Power

The discussion of the paper on "Internal Combustion Engines versus Central Station Power" was carried on by R. E. Fisher of Pacific Gas & Electric Company, who briefly summed up the salient points of the paper, and by C. R. Hunt of Robbins & Myers, who stated that the internal combustion engine was the forerunner of central station power and blazed the way for extensions in the future.

A. E. Holloway, of the San Diego Consolidated Gas & Electric Company, brought out the point that the internal combustion engine has a great advantage over the central station service, in that it can go into an undeveloped territory and give satisfactory service at a low cost, thereby developing territory to such a point that the central station can later extend its lines and serve the territory profitably. He pointed out that the most serious competition of the central station is the Diesel and semi-Diesel type of combustion engines operating on high load factor, but that the ever increasing price of oil, the excessive first cost and high maintenance of these engines are strong arguments in favor of central station power.

H. H. Courtright of the Valley Electric Supply Company of Fresno then gave a brief summary of his paper on "Standardization of Wiring Methods," and asked for some action that will result in one standard code for the entire state, so that the contractor will know exactly the conditions that he will meet, no matter where he goes to bid on a job.

R. A. Balzari of the Westinghouse Electric & Manufacturing Company then discussed his paper on "The Electrical Development of the Oil Lands," and stated that the committee has been able to secure but very little accurate data on the cost of installations. He recommended that next year the commercial committee have a committee on the same subject, and that this committee should be able to get accurate data by requesting the managers of the large oil companies to keep accurate cost data on the operation and maintenance of their gas plants during the coming year.

#### ACCOUNTING SESSION

The Accounting Committee session was called to order by Chairman P. R. Ferguson of the Southern Sierras Power Company, who stated that the symbol of the National Electric Light Association  

$$\frac{E}{C} = \frac{R}{\text{to the Auditing Department meant Co-}}$$
 operation equals Efficiency and Results.

The discussion of the paper by C. P. Staal of the Southern California Edison Company, on "Some Features of Construction Accounting," was begun by Mr. Staal reading a brief resume of the paper.

R. R. Reidford, auditor of the Pacific Gas & Electric Company, said in part:

"I am heartily in accord with Mr. Staal in his demand for not only a correct but a uniform method of recording and compiling the details of construction costs as a part of the general accounting system of public utility corporations."

Mr. Reidford then went on to point out that the segregation of all overhead charges to primary accounts is not possible, and that this can be done only on an arbitrary basis. He spoke of the necessity of cooperation between the engineering and accounting departments in order to maintain a perpetual inventory.

In concluding, Mr. Reidford commended the work of Mr. Staal along this line, and hoped that the result of his labor would be accomplished in the very near future.

A. B. Carpenter, of the San Joaquin Light & Power Corporation, advocated the distribution of overhead construction costs over each particular enterprise, and trusted that the Commission ruling might be amended to authorize such distribution.

Mr. Carpenter testified to the value of the perpetual inventory of property kept by the statistical department of his company. He stated that the foundation for the inventory was the valuation established by an engineering company in conjunction with the Railroad Commission.

Mr. Warner stated that his company is preparing a complete inventory and advocating the maintaining of such inventory perpetually with costs as well as physical data.

In bringing the Accounting session to a close, President R. H. Ballard, of the National Electric Light Association, spoke a few words expressing the importance of the work of the accountants, especially at this time. He stated in closing that accounting is now recognized as one of the most important of the professions.



## LATEST IN EVERYTHING ELECTRICAL

### E-Z WIRE RECEPTACLE

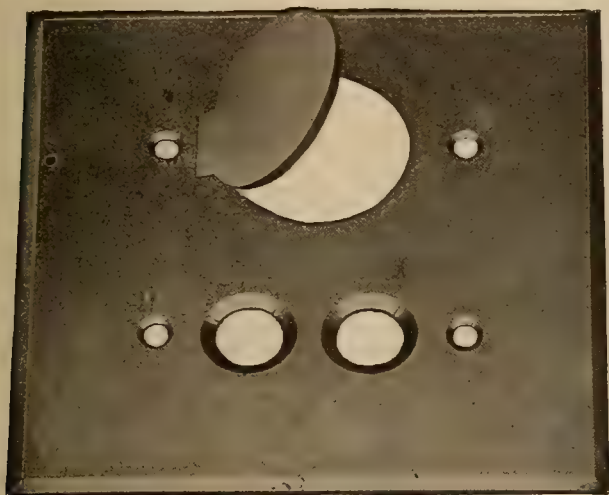
One of the E-Z wire devices made by the Peerless Light Company of Chicago and New York. This is a flush receptacle and plate combined. It is simple and compact and being cast in one piece there is nothing to get out of order. The labor of installation is greatly reduced, the only tools necessary for that purpose being a brace, bit and screw-driver. This results in a saving of time, labor and vexatious trouble. It has two No. 14 wire leads. All standard screw plugs used on electrical devices will fit it.



Wire receptacle which combines receptacle and plate, and is unusually simple and compact.

### Combination Switch and Receptacle Plate

Another device of this company is the combination switch and receptacle plate. This eliminates the inconvenience of having switch and receptacle in different parts of the room. There is scarcely a room in the house in which outlets are not required for some convenience appliance, ranging all the way from a washing machine to the manipulation of a curling iron. As may be seen, by this simple device the labor of installation is greatly reduced.



The combination switch and receptacle plate which makes it possible to have both switch and receptacle in the same part of the room.

## Book and Bulletins

### Radio Engineering Principles

By Henri Lauer and Harry L. Brown; 304 pages, 6 x 9, 250 illustrations. Published by the McGraw-Hill Book Company and for sale by the Technical Book Shop, Rialto Building, San Francisco.

This new book is a complete radio text book, covering the new and extensive developments made in this subject during the war. It is therefore devoted very largely to the study of the characteristics and use of the three-electrode vacuum tube in radio-telegraphy and radio-telephony, since it is around this device that the present and future of the science seem to center. In order to meet the requirements of a general text book, the principles involved in the older radio apparatus are also treated with sufficient fullness to inform

the reader on all essential principles of wireless communication.

The two authors have unusual preparation for the writing of such a book. Henri Lauer was formerly Lieutenant in the U. S. A. Signal Corps and did work as assistant in the preparation of training literature on radio theory and equipment. Harry L. Brown, who was formerly Captain in the Signal Corps, was in charge of preparation of training literature on radio theory and equipment.

### Book on Power

The Esterline Company of Indianapolis, Indiana, has recently published a new book on Power Factor intended especially for engineers and executives.

This book explains the subject of power factor in understandable language, discusses the evil effects of low power factor, and tells how such conditions may be detected, diagnosed and remedied.

### Oil Refinery Manual

The Celite Products Company with western offices in San Francisco and Los Angeles, have published a most interesting manual which bears the title, "The Insulation of Oil Refinery Equipment."

This gives in detail the standard specifications of that company for the insulation of many types of heated equipment. It is remarkably well illustrated throughout, with some fifty pictures and diagrams showing the theory and practice of making installations. A two-page diagram shows the application of Sil-O-Cel Insulation to Standard Petroleum refining equipment to produce the highest thermal efficiency.

### Industrial Arts Index

The Industrial Art Index, published by the H. W. Wilson Company, publishers of indexes and reference works, is the means of quick reference to technical magazines. It indexes every important article in more than a hundred and fifteen leading technical and industrial journals. Both the Electrical World and the Journal of Electricity are included on its list.

The Index is now issued ten times a year; that is, monthly except in July, just after the six months cumulation, and in November, while the annual or the final two-year cumulated volume is in preparation. This publication has been found especially valuable in that it does away with the keeping of individual cards index of any magazines or type of articles appearing in these magazines.

### New Edition of Steel Pole Treatise

The Bates Expanded Steel Truss Company of Chicago, Illinois, have recently published a 128-page 1921 edition of their Steel Pole Treatise. This treatise is a compact engineering handbook of value to engineers and pole users. It contains information for use in the construction of modern transmission lines, electric railway lines, street lighting systems and outdoor substations.

The information includes a discussion of the engineering principles governing the design, selection and installation of all types of poles, a complete analysis of the elements governing the selection of factors of safety, and complete engineering tables. These tables include wire sags for all temperatures and spans, the conductor sizes required to transmit electric power various distances at any phase, voltage, frequency and power factor, the transverse loads at various velocities, the clearances necessary to determine the height of a pole, physical properties of wires and cables, and many formulæ and example problems which illustrate the use of the tabulated information in the solution of all pole line problems. The company is sending copies of this handbook on request.



## NEW ELECTRICAL DEVELOPMENT

(A controversy over municipal street railway finances and an announcement of increased lighting charges are reported among items from the Northwest district, while under those from the Pacific Central and Southwest districts are several relating to the development of agriculture through electricity as well as a prediction of increased voltage on power lines and announcements of rate increase applications. From the Intermountain district come reports concerning municipal illumination and the development of electrically operated mines.—The Editor.)

### THE PACIFIC NORTHWEST

**SEATTLE, WASH.**—The Empire Power Company has been incorporated by N. H. Hull and others for \$100,000.

**EVERETT, WASH.**—At a special election May 25th citizens were called upon to vote for or against a bond issue for \$2,000,000 for a municipally owned light and power system.

**FOREST GROVE, ORE.**—J. R. Thompson of Portland, expert electrical engineer, advised against duplication of the city lighting plant at this time but advised installation of another boiler.

**SEATTLE, WASH.**—W. R. Hendrey & Company, agents for the Pittsburgh-Des Moines Steel Company, have closed a contract for a 300,000-gallon hemispherical bottom steel tank on a 100-ft. tower for the city of Moscow, Idaho.

**CENTRALIA, WASH.**—At a meeting of the newly elected directors of the Kane Pneumatic Shock Absorber Company, plans were laid for immediate erection of a power plant to furnish power to the company factory on Fords Prairie. It will generate from 750 to 1500 kilowatts.

**ANACORTES, WASH.**—Chas. Freeman, original locator of the power site the rights to which were later acquired by the city of Seattle, has located two other power sites below the site upon which the city is building. One of them is capable of developing 20,000 horsepower and the other 10,000 horsepower.

**TACOMA, WASH.**—The firm of Albertson Cornell Bros.-Simpson of Tacoma, Wash., were awarded contract for constructing the State Group power house and heating plant at Olympia. Their bid on the contract was \$155,263. The Western Construction Company of Seattle was the low bidder at \$132,340 but refused to sign the contract, claiming a clerical error in their bid.

**KLAMATH FALLS, ORE.**—One hundred men in the employ of the California-Oregon Power Company are constructing an additional plant on the Keno Power Company's plant site near here. The Keno company was recently sold by Kerns Brothers, its founders, to W. D. Parker. It is generally believed that Parker has leased or sold the Keno system to the California-Oregon Power Company, giving it a monopoly in the local field.

**SEATTLE, WASH.**—Authority for Mayor H. M. Caldwell and City Comptroller H. W. Carroll, on behalf of the city of Seattle, to sign a stipulation preliminary to the issuance of the final permit for the city's free development of the Skagit River power project is contained in an ordinance introduced recently in the city council. One of the conditions of the stipulation is that the city shall sell electric current developed on the Skagit project to consumers without a profit.

**SEATTLE, WASH.**—Increased charges for current furnished by the city lighting department are proposed in an ordinance introduced in the city council at its special meeting recently by the public utilities committee. The ordinance increases the monthly rates charged for business and power purposes, but not the charge for residence uses, including cooking and household appliances. It also provides a service charge of 25 cents a month for each meter in use. This will apply to meters in residences

as well as business houses and industrial plants, and will affect every consumer of city light. It is in addition to all other charges, either minimum or otherwise.

**SEATTLE, WASH.**—In a recent letter to Mayor Hugh M. Caldwell D. W. Henderson, superintendent of the municipal street railway, protests against the proposal of City Treasurer E. L. Terry to put the department on a warrant basis June 10. As a reason for his protest Supt. Henderson submits a comparative statement showing that the street railway deficit for the month of April was \$37,320.45 less than it was in March, and that the deficit may be further reduced this month. Mayor Caldwell said Superintendent Henderson's report and a recommendation from the city comptroller will be taken up at the conference to be held between the members of the city council and the Seattle banks, and that undoubtedly some satisfactory plan of financing the street railway will be worked out.

**SEATTLE, WASH.**—The A B C Sales Company is being incorporated at Seattle by Burton R. Stare, Emerson Knoff and J. M. Thomas, and will open up the A B C electric shop at 1531 Third Avenue on June first, specializing in the wholesale and retail distribution in Seattle, Tacoma, and possibly at other points in the section later, of the A B C electric washing machine, Hoover carpet sweepers and electrical appliances of all kinds. The personnel of the company will consist of Burton R. Stare, president; J. M. Thomas, vice-president and manager, and Emerson Knoff, secretary and treasurer. A few weeks after the store is opened at Seattle a duplicate of it will be opened at Tacoma. Mr. Stare will also continue to look after his Pacific Lamp & Supply Company business at 325 Yesler Way, Seattle, and Mr. Knoff will continue as local manager and co-partner of the Juneau Hardware Company's Seattle branch office at 325 Yesler Way. Mr. Thomas was with the National Cash Register Company for a number of years and later manager for the Wholesale Typewriter Company.

### THE PACIFIC CENTRAL DISTRICT

**FRESNO, CAL.**—The James Irrigation district will receive bids on May 15, for \$1,000,000 6 per cent bonds.

**CHICO, CAL.**—A one-day convention of 500 employees of the Pacific Gas and Electric Company was held in this city recently.

**HAMMONTON, CAL.**—Fire destroyed the substation of the Pacific Gas and Electric Company here with an estimated loss of about \$25,000.

**YREKA, CAL.**—The county board of supervisors dismissed a petition for an irrigation bond election affecting the Grenada and Big Springs district.

**MODESTO, CAL.**—Farmers from the West Side have petitioned the board of supervisors to organize the West Stanislaus irrigation district, which will irrigate 36,000 acres.

**LEMOORE, CAL.**—The taxpayers of Lemoore cast a decisive vote against the intended bond issue of \$58,000 which was to be spent in building a municipally owned gas plant.

**SAN FRANCISCO, CAL.**—The Pacific Electric Railway Company have applied to the Railroad Commission for authority to construct a spur

track at grade at 14th Street and Daley Avenue in the city of Long Beach.

**SAN FRANCISCO, CAL.**—The Board of Public Works has awarded the Construction Company of North America the contract for the construction of aqueduct tunnels in the mountain division of the Hetch-Hetchy project.

**SAN FRANCISCO, CAL.**—Wells Fargo Nevada National Bank has received funds for the payment of the semi-annual coupon, due July 1, 1918, on the Oakland Transit Company's first consolidated mortgage 5 per cent gold bonds.

**MARTINEZ, CAL.**—A new irrigation district in the Lone Tree section was authorized by the Board of Supervisors. The district is to include 2,035 acres of land with an assessed valuation of \$92,095. The Board ordered the plans for the district submitted to the State engineers for approval before calling the election.

**SACRAMENTO, CAL.**—A site for a masonry dam at the lower end of the Iron Canyon of the Sacramento River, five miles upstream from Red Bluff, has been discovered and determined upon by engineers from the United States Reclamation Service. A hard rock foundation upon which the dam will rest, if built, has been found.

**SAN FRANCISCO, CAL.**—An application for a permit to construct an overhead crossing over the tracks of the Northwestern Pacific Railroad Company between Fieldbrook and Little River Junction has been filed with the Railroad Commission by the Humboldt Northern Railway Company. The crossing is proposed as part of an extension into new timber country in Humboldt county.

**RED BLUFF, CAL.**—A consulting board of engineers representing the United States Reclamation Service will meet in Red Bluff and decide on the site for the proposed Iron Canyon dam. According to W. A. Beard, secretary-manager of the Sacramento Valley Development Association, who was here the latter part of last week, the present series of borings to determine the site of the dam is nearing an end.

**TULARE, CAL.**—The census bureau estimated that farm values in Tulare county, California, had increased over \$56,000,000 from 1904 to 1910. A large part of this gain was due to electric service in the county, yet the total investment in the electric service was less than ten per cent of the gain in land values. The installation of a 20-horsepower motor may change the value of a hundred acres of land from \$20 to \$200 per acre.

**SAN FRANCISCO, CAL.**—Pending the decision of the State Supreme Court to determine the constitutionality of the act which created the State Irrigation Board, members have suspended their work. The board, it was announced will conduct no more hearings nor pursue investigations until after the court's decision is rendered. A third hearing in the contest of the Kern Delta Irrigation District, which was to have come up last week was postponed indefinitely.

**WILLOWS, CAL.**—As a further insurance against a shortage of power during the irrigation season, P. B. Cross, president of the Provident Irrigation District, is installing a large electric power generating plant capable of producing 2500 horsepower. The machinery was



shipped from Connecticut by freight and occupied but 12 days in transit. The generator for the plant weighs 60 tons, and when it is in working order, which will be about June 1, no fears concerning a lack of power will be felt by the rice growers of the district.

**SAN FRANCISCO, CAL.**—The Fall River Telephone Company, an unincorporated association, has applied to the Railroad Commission for a certificate of necessity under which to operate a telephone system in Fall River Valley, Shasta county. The company has 66 miles of telephone line and gives service to Fall River Mills, Glenburn, Kayton, Dana, McArthur and Pittville. It also connects with what is known as the Bass line at Fall River Mills and with the Snell line at Pittville.

**SAN FRANCISCO, CAL.**—The Ojai Power Company has applied to the Railroad Commission for authority to increase its rates, claiming that its present charges are insufficient to meet the costs of power. The company says that up to the present time the increased cost of producing and distributing power has been borne by its stockholders without complaint but they do not feel willing or able to carry recent increases. The company buys its power from the Southern California Edison Company and is therefore affected by the surcharge of 27% the Edison Company has been authorized to collect.

**SAN FRANCISCO, CAL.**—The Coast Valleys Gas and Electric Company wants to increase its charges for electricity sold in Salinas, Monterey, Pacific Grove, King City, and a number of smaller communities in Monterey county. The company buys its energy from the Sierra and San Francisco Power Company which is now operated under lease by the Pacific Gas and Electric Company, generating but a small percentage by means of steam plants located at Monterey, Salinas and King City. The company says that since its present rates were fixed by the Commission it has been forced to meet additional costs of materials and labor.

**SAN FRANCISCO, CAL.**—Two forms of bids have been received by the Board of Public Works for new construction on the Hetch-Hetchy project. The cost plus form, which for the first time in this city was introduced in the calls for the bids, was competed for by the Construction Company of North America, builders of the Twin Peaks tunnel. The Construction Company cost plus bid was \$7,802,952, including a fee of \$1,190,329. The Storrie bid was \$8,951,980, including a fee of \$1,074,285. The City Engineer's office, in a preliminary analysis of the cost plus bids, found that the Construction Company's bid was \$1,149,028 lower than the Storrie bid.

**NEVADA CITY, CAL.**—Ribbons of fire will soon extend from the San Francisco Bay region far into the mountains of northeastern California, according to electrical engineers. New inventions in insulation, it is stated, will make it practicable to increase the load of power wires from less than 100,000 volts to 220,000 volts, with the result that the wires and probably the steel supporting towers will gleam brightly at night. These high power wires are first to be used in connection with the great hydroelectric project of the Pacific Gas & Electric Company in the Pit river region of Lassen, Modoc and Shasta counties and will convey electrical energy upwards of 400 miles.

**OROVILLE, CAL.**—Grizzly valley, Plumas county, on the Middle Fork of the Feather river, will be transposed into one of the largest water impounding reservoirs in Superior California from which farmers of the Sacramento valley will be able to obtain irrigation water. This is according to information received here from officials in charge of the project who passed through Oroville. According to representatives of the Middle Feather River Development Company, a New York syndicate which is promoting the project, the dam is to impound 72,000 acre-feet of water. Of this portion Butte county

farmers will be guaranteed 45,000 acre-feet, if they see fit to purchase it from the company.

### THE PACIFIC SOUTHWEST

**PHOENIX, ARIZ.**—All bids were rejected for the completion of the Lyman Dam, and bids are to be submitted again by the Lyman Water Company.

**TOMBSTONE, ARIZ.**—Farmers of San Pedro Valley are preparing petitions to be submitted to the Board of Supervisors asking for the creation of an irrigation district.

**LOS ANGELES, CAL.**—Plans are under way to call a bond election at an early date to vote on a \$2,500,000 water bond issue, for construction of several large reservoir projects.

**LONG BEACH, CAL.**—A special line, to serve Long Beach's industrial needs, and to extend direct from the harbor district to Dominguez Junction, will be built at once by the Pacific Electric Company.

**LOS ANGELES, CAL.**—Application has been made by the Electric Street Railway for a franchise granting the right to construct a double track electric street railroad upon Western Avenue from Melrose to Santa Monica Boulevard.

**PASADENA, CAL.**—A solid granite expose dam 40 ft. wide at the base, 350 ft. wide at the top and 325 ft. high in Pacoima Canyon is planned, as announced by Storm Drainage Engineer John H. Reagan. The dam will have a drainage area of 20 square miles, or 18,000 acres.

**PASADENA, CAL.**—The city of Pasadena has reopened negotiations with the Southern California Edison Company for the purchase of the company's light and power plant in Pasadena. Should the deal go through, the Edison plant would be merged with the Pasadena municipal light and power system.

**LOS ANGELES, CAL.**—It is rumored that a movement is under way for the removal of the Pacific Electric tracks from Hill, Sixth and Main streets, and the boring of a tunnel to Flower on Figueroa, from the new terminal to be erected at the present Hill Street site. The Main Street tracks could be eliminated by re-routing Pasadena lines, etc.

**SAN DIEGO, CAL.**—An order issued by the Railroad Commission today authorizes the San Diego Consolidated Gas and Electric Company to issue \$500,000 of its 7 per cent preferred stock and common stock or additional preferred stock of the par value of \$55,800. The money obtained from the sale of the stock is to be used to defray construction expenses.

**PRESCOTT, ARIZ.**—The firm of Robert Connell, Jr., Electric Shop and the Vyne Bros. Electric Company have merged their interests, forming one of the largest electrical merchandising and contracting concerns in the state of Arizona. Through the past twelve years the four members of this firm have worked together in the electrical industry, with Frank Wright years ago, and later with the Arizona Power Company and the Prescott Gas and Electric Company.

**PEORIA, ARIZ.**—An event which will be of far-reaching and tremendous importance to the section of Agua Fria occurred when electricity from the Water Users' Association transmission lines was turned on the lines recently constructed west of the Agua Fria. There are many acres of land in that section that could not be handled successfully with engines which will now be included in the productive area of the valley.

**BLYTHER, CAL.**—Two million dollars are to be expended in the installation of an irrigation system, flood protection, and a railroad line, to bring into cultivation 10,000 acres of the cream of the Cibola valley, across the Colorado river in Arizona, 30 miles south of here. An intake has been selected and a river crossing where a railroad bridge will be built over the Colorado was surveyed. The property is to be developed into a mammoth Pima cotton plantation.

### THE INTER-MOUNTAIN DISTRICT

**CHALLIS, IDA.**—Challis Light & Power Company has been incorporated by W. W. Adamson at \$50,000, \$14,500 of which has been subscribed.

**CHINOOK, MONT.**—Representatives of the Montana Power Company have been discussing with local business men and the authorities the proposition of extending the Great Falls power lien from Havre to Chinook.

**DENVER, COLO.**—The "open shop" has been endorsed by the Denver section of the American Institute of Electrical Engineers. Resolutions similar to those adopted by the directors of the Civic and Commercial Association, the Rotary and Kiwanis Clubs, were adopted by the electrical engineers on motion of J. C. Lawler.

**EUREKA, UTAH.**—Arrangements have been made for the immediate resumption of development operations on the mining property of the Tintic-Davis Company of the North Tintic district. Some time ago the company installed machinery and made connection with the lines of the Utah Power & Light Company for electric service.

**TWIN FALLS, IDA.**—Twin Falls is to have a group lighting system in the business district. Contract for the installation of the lights has just been approved by the city council. The system will cost \$16,200 and will include 108 lamp posts of the Arcadian style. Four lights will be installed at the railroad station grounds, and the remainder will be placed along Main Avenue and Shoshone Street and the court house and city park grounds.

**PROVO, UTAH.**—The Phoenix Utility Company has resumed work on the replacement of the Utah Power & Light Company's flume in Provo Canyon. The contractors began the work about three years ago and had done a considerable amount of work on the flume and were prepared with material and men to finish the work. The war, however, closed them down. They are said to have a large force of men and will rush the work to its completion.

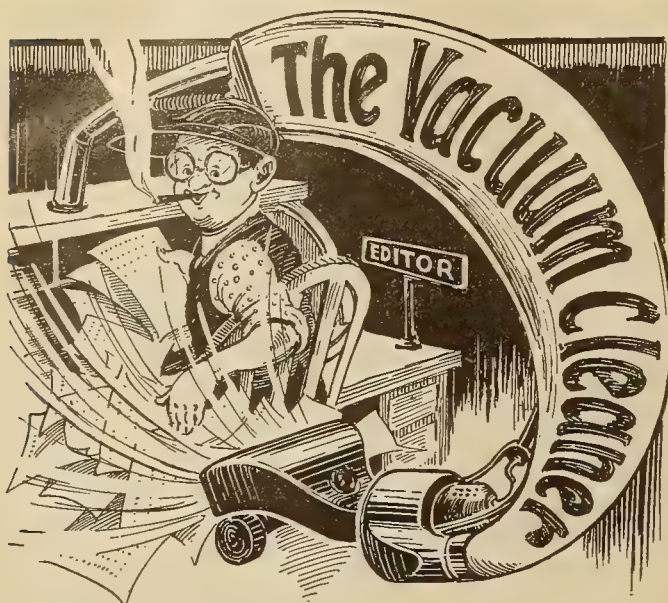
**LOGAN, UTAH.**—A lighting system of intense brilliancy has just been installed on the Agricultural College campus, the grounds on which the main buildings stand. It also makes the college hill unusually conspicuous at night, as the lights can be seen all over Cache county. Fifteen large lamp posts with the wire cables which transmit the electricity running underground comprise the system. The power is supplied by the state power plant at the mouth of Logan Canyon, one mile from the campus.

**DENVER, COLO.**—Striking employees of the Denver Gas & Electric Light Company were addressed recently by Fred Wesley, business agent for the Building Trades Assembly. Mr. Wesley told the gathering of approximately 150 men that preparations were under way for the opening of negotiations with the company officials. W. J. Barker, general manager of the company, repeated that the company has nothing to negotiate and that the strikers either must accept the award of the State Industrial Commission or remain off their jobs.

**IDAHO FALLS, IDA.**—A demonstration of electrical household appliances was held during a recent week by the Utah Power & Light Company and the Star Electric Company. The purpose of the demonstration was to bring to attention the results to be gained by the use of electrically driven labor-saving devices. Several rural sections have made applications for line extensions to provide for residence service, and in order to make the average rural extension practicable it is necessary that prospective customers guarantee certain annual revenues and this can only be accomplished by the use of domestic electrical appliances.

**SALT LAKE CITY, UTAH.**—Western distribution of Titan storage batteries, known as "the battery with a different guarantee," has been taken over by the Western Electric Company of Salt Lake City.





The language of the business man recommends him as even more desirable than the honorable lawyer as a public executive. A Western man of the electrical industry seems to have been firmly convinced of this fact when he made the following remark:

"If a man were to give another an orange he would simply say: 'I give you this orange.' But when the transaction is intrusted to a lawyer to put in writing he adopts this form: 'I hereby give and convey to you, all and singular, my estate and interests, right, title, claim and advantages of and in said orange, together with all its rind, juice, pulp and pips, and all rights and advantages therein, with full power to bite, suck and otherwise eat the same or give the same away with or without the rind, skin, juice, pulp or pips, anything hereinbefore or hereinafter or in any other deed or deeds, instrument or instruments, of whatever nature or kind whatsoever to the contrary in anywise notwithstanding.'"

\* \* \*

A public utility company is not necessarily a thing of great size even though it is most generally thought of as an affair of that sort. The following extract from a recent report of the California State Railroad Commission shows that most of us have not really understood the full capacities of a utility company, after all:

"Wilhelm and Bertha Kretschner, owners of a water plant located at 735 West 116th Street, Los Angeles, today applied to the Railroad Commission for an order increasing the rates they charge their two customers or for authority to retire from the public utility business."

A man's work inevitably affects his vocabulary, as may clearly be seen in glancing at the love poem of a certain romantic butcher boy. We publish the creation intact below:

Deer Heart, I'm in an awful stew,  
How I'll re-veal my love for you?  
I'm such a mutton-head, I fear—  
I feel so sheep-ish when you're near,  
I know it's only cow-ardice,  
That makes these lamb-entations rise,  
I dread a cut—let me explain;  
A single roast would give me pain;  
I should not like to get the hooks,  
And dare not steak my hopes on looks.  
I never sausage eyes as thine.  
If you would butcher hand in mine  
And liver 'round me every day,  
We'd seek some ham-let far away;  
We'd meat Life's frowns with Love's caress  
And cleaver road to happiness.

\* \* \*

Every man has his own theory concerning the secret of success because each one sees the process in the light of his own experience, and so we have almost as many success mottoes as successes. A few of the most striking ones are given below:

"Keep cool," says the ice.  
"Take pains," says the window.  
"Be up to date," says the calendar.  
"Never lose your head," says the barrel.  
"Make light of trouble," says the fire.  
"Do a driving business," says the harness.  
"Aspire to greater things," says the nutmeg.  
"Stick to it," says the glue.

\* \* \*

A certain colored minister showed how much he had profited from the experience of maintaining a congregation, raising a family and perhaps even venturing into business, when he responded thus to a request to define the word "perseverance": "Perseverance," he said, "means, firstly, to take hold; secondly, to hold on; thirdly and lastly, to nebber leave go."

\* \* \*

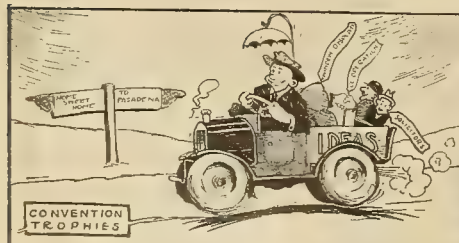
One never can tell just what meaning a word may have to another, even though that word be as carefully and precisely chosen as is humanly possible. It is simply because of the incongruity of our English language that such episodes as the following occur:

Stranger—Please tell me where I will find a chiroprapist.

Villager—Don't know. You see, I'm a Methodist and the folks next door are Baptists and across the street they are Episcopalians, and—

But the stranger was gone.

## Echoes of Pasadena



Ideas men have gleaned at convention.  
Are vastly too many to mention.  
One chap, as I live,  
Has purchased a 'fliv,'  
To take trophies home—his intention.



Now words of 'co-op' campaign mission  
And several committees' decision  
Float soft through the air  
As he sits in his chair  
And dreams the electrical vision.



And now of convention he's dreaming.  
His head with ideas is just teeming.  
But nevertheless,  
It's not hard to guess  
The mem'ries that keep that smile beaming.



IN THIS ISSUE: Hydroelectric Development in the Orient

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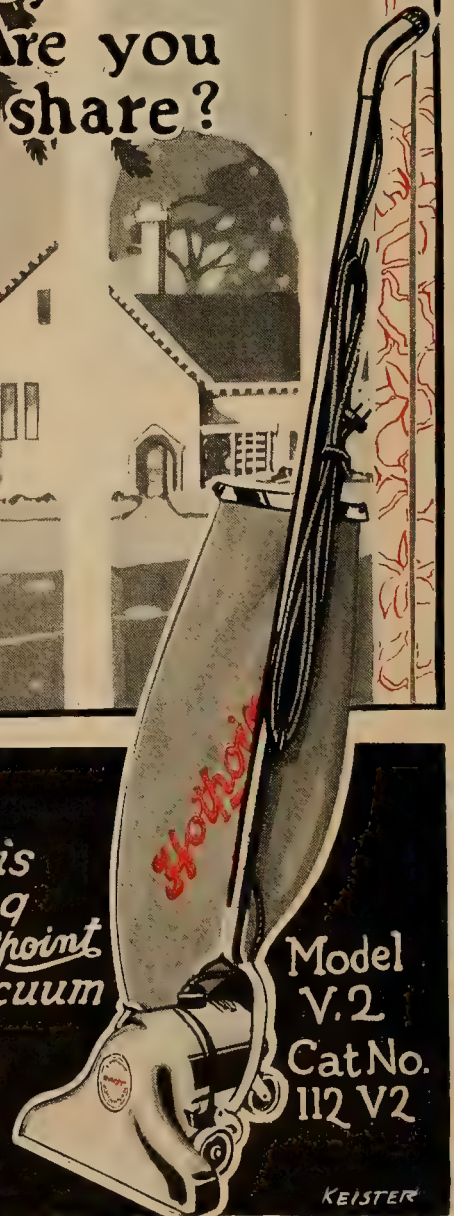
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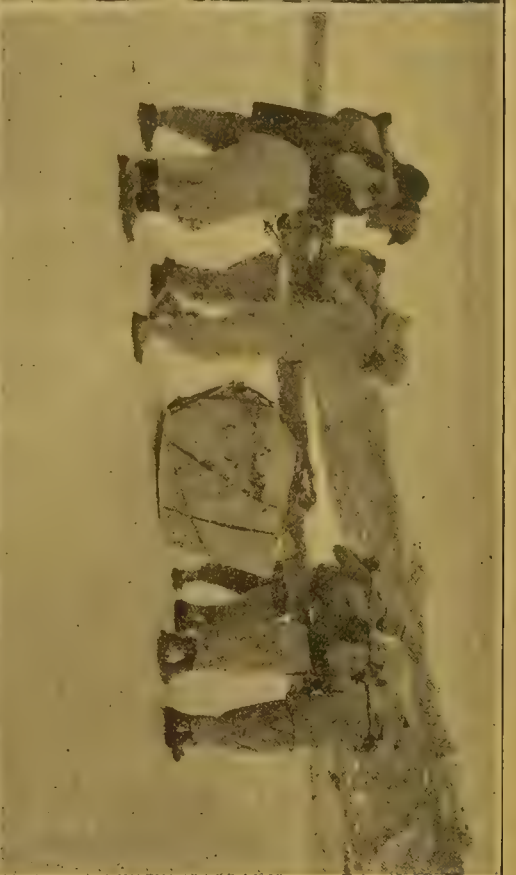




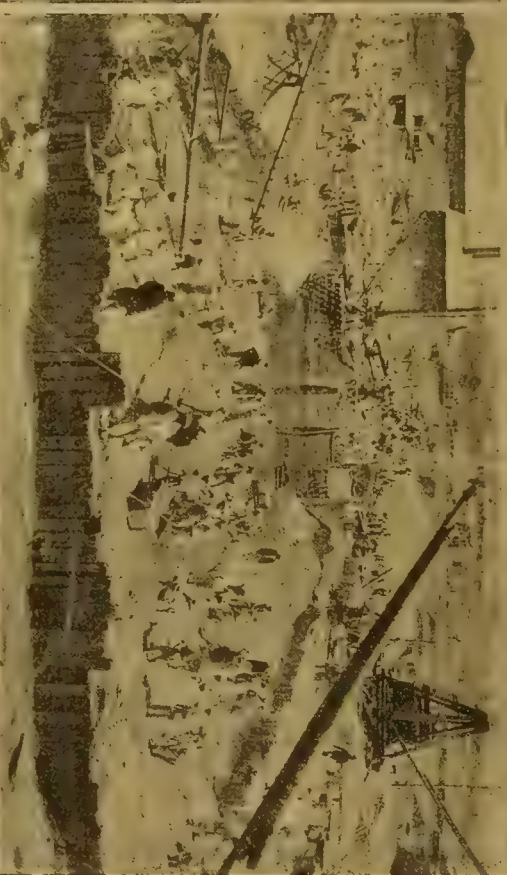
Building trestle with 45-ft poles for stringers



Building steel penstock leading from tunnel



Packing large rock, weight 1½ tons, over frozen river



Excavating inside of sheet piling to bed rock

## THE LAST NEW WEST

The engineer of the West, with a constructive vision that has made possible attainments equalled nowhere else in the world in physical construction, now finds opening before him a vast new panorama, the last new West, consisting of the Pacific with its isles and the countries which line its borders. To take advantage of this new situation, a familiarity with customs of peoples and conditions in climate and natural phenomena hitherto unencountered in engineering practice must be mastered, ever bearing in mind an ideal of service based on the truism that "he profits most who serves best."





# JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST  
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44

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Number 12

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## Electrical Trade with the Orient

**T**HE dawn of the new decade has brought into the full high-light of world attention the populous lands bordering on the Pacific Ocean. In our own country, there has never been an era in which the Pacific Coast region has played so important a part in framing national and international policies. Typical of the widespread interest throughout the United States in the problems of the Pacific was the holding of the Seventh National Foreign Trade Convention this year in San Francisco—the largest and most representative gathering of its kind yet held.

A growing realization of the important part the Pacific is to play in the destiny of America is everywhere apparent. Recent financial and diplomatic missions, highly gratifying in their results, have gone forth to the Orient—and their full measure of success may be attributed to the character of their personnel, including such men as Frank A. Vanderlip, Thomas W. Lamont and Benjamin Ide Wheeler. This July a special Congressional party is to go out to the Orient to get in touch with the affairs of the Pacific.

Attention is directed particularly to China. The possibilities of future trade between China and America are so vast as scarcely to be guessed at. Our \$100,000,000 gained yearly through export sales to China amount to little more than beggar's pence in comparison to the sum which will be aggregated before the century is half over. If we can only sell each human in China an additional 25 cents' worth of goods during the year, we will thereby double our present export trade with that country!

According to the latest available figures, of electrical materials and fittings imported into China, only 20% came from the United States. Surely such a paltry percentage can be bettered by a systematic cultivation of this great trade field. China is beginning to manufacture electrical goods on her own account—especially mazda lamps—but there will always be a magnificent market there for many types of electrical machinery and appliances made in America. That American manufacturers are fully alive to the part they must play in the electrical development of the Orient is indicated by the recent trips across the Pacific of such men as H. M. Herr and L. H. Osborn of the Westinghouse Electric and Manufacturing Company, and A. W. Jones, Manager of the Far Eastern Division, International General Electric Company.

America's share in the expanding prosperity of Pan-Pacific lands is likely to be great. It will be great in proportion to the energy and wisdom displayed by American world traders in the conduct of their sweeping sales campaign.

With the exhaustion of our present supply of fuel oil a problem that must be considered for solution in the not distant future in the minds of the engineers is that of getting the most out of the supply of fuel oil while it lasts by increasing the efficiency of oil burning plants to the utmost.

### The Reward for Efficiency

Along these lines the gas industry, which uses 4,800,000 barrels of crude oil per year in California with an approximate increase of 10% each year, is about to conduct a series of practical experiments at Santa Barbara and San Jose with the two most common types of gas generators, to try to find the most efficient gas; that is to find a gas which can be made most economically and at the same time will contain sufficient B.t.u. value per cubic foot to insure the consumer an efficient fuel with the type of burner now used.

During the war England was threatened with a coal shortage, and to conserve this fuel the gas manufacturers produced a gas that was low in heat value but which produced great quantities of benzole and tuolene, both of which were in great demand by the munition works. About twice as much of this low grade gas was produced from a ton of coal as had been done in the pre-war days, and in spite of the reduction of B.t.u. value the gas was found to be only slightly less efficient.

With this in mind these experimental stations will strive to find under what conditions the most gas can be produced from a barrel of oil and an efficiency curve of gases of varying B.t.u. value with the present type of burners. With these two questions settled it will be an easy matter to find the most efficient gas that can be produced from the least oil.



Electrical and mechanical engineers, who in the steam power plants of the West burn over three times as much oil as the gas engineers, should by experiment and constant study strive to increase the efficiency of the steam power plants and help out in this work of conserving one of the greatest of our natural resources, and one which is fast being exhausted. This is the age of efficiency and invention, and there is a great field for the investigation of the efficient handling of an oil burning power plant.

At the recent N. E. L. A. convention at Pasadena Commissioner Edgerton, president of the California Railroad Commission, in no uncertain manner put his stamp of approval on the justice of rewarding public utilities for results in obtaining new economies and putting into practice new inventions that bring about increased efficiencies. Here, then, is the broadest possible endorsement of studies looking to betterments of all kinds in cost of service. The opportunity is a big one, and it is believed the utility companies will not be long in taking full advantage of this broad-visioned policy outlined by this forward-looking regulatory body in the West.

Sympathy and courtesy are the two great factors which have more to do with bringing about firm international relations than any other qualities. Three great problems considered from their broad-aspects await solution today in the building up of more friendly relations upon the Pan-Pacific, particularly those relations that have to do with the great island kingdom of Japan. The first is the Japanese problem in California, the second the question of a possible growing suspicion in the minds of Americans as to the aim and purposes of the Japanese nation which in a measure has shaken the confidence of American citizens insofar as activities in Korea, Mongolia, Manchuria, Siberia and Shantung are concerned; and thirdly, the question as to how best to work out an idea of cooperative helpfulness whereby American and Japanese capital may be used to develop China, improve her communications, and accomplish results based upon broad humanitarian motives in which no nation may be the favored nation nor acquire an undue advantage.

Men of the West have followed with profound attention the recent utterances of Frank A. Vanderlip, who has just returned from a most interesting and important informal visit to Japan. We agree with Mr. Vanderlip that whether we like it or not, a fact, and not a theory confronts the nations bordering the Pacific, and that is, that the island kingdom of Japan, in territory not as large as California and having only one-twelfth the arable land, possesses a population of 57,000,000 people, increasing at a rate of 600,000 per annum. We say they are not to immigrate to America, nor should they go and thrust themselves upon their sister nations to their west. Yet the insistent economic urge from within, pressing upon the world without must receive the courteous and sympathetic attention of the entire civilized

world. Serious minded and thoughtful men grow tired of the yellow journalistic pleas we hear in certain of the publications of this country and of Japan, which endeavor to stir up unfriendly and unkindly relations with our foreign neighbors. Unquestionably the more thoughtful democracy of both nations yearns for a helpful and cooperative sympathy and courtesy in problems of mutual concern. The entire world is sick at heart, and there is no time for selfishness and narrowness of vision.

Americanism, true and clear-eyed, ever bearing in mind its traditions of the past, views the great world problem not from a selfish viewpoint but rather along the lines of the necessity for an economic reorganization of the entire world that would handle these problems in a large way. If we are to develop friendly international trade relations we must remember that those with whom we trade must have the wherewithal to meet their obligations, or such trade relations cannot exist with permanence. Hence the great modern scheme of economics must be revised to meet a constructive policy that will extend not only sympathy and courtesy in the ideal, but in a practical way offer helpful financial assistance, seeing to it that the great countries of the Pacific upon which dwell over one-half the peoples of the world receive such thoughtful and constructive attention as will make it possible for these peoples to develop with an assured economic destiny.

All the world knows that our imports and exports have vastly increased between the United States and foreign countries during the last eight-year period. Few, however, appreciate the fact that foreign trade with Pacific Coast points has, in ratio of increase, far outdistanced any other district of the United States. Thus, by reference to the foreign commerce reports of the United States it is found that in 1911 our total imports were practically one and one-half billion dollars, while eight years later, 1919, these imports increased to almost an even three billion dollars, representing a doubling of our import schedule. It is interesting to note, however, that during this same period imports to Pacific Coast ports increased from almost an even one hundred million dollars in 1911 to almost five hundred million dollars in 1919, thus increasing in a ratio of five times that prevailing in 1911.

Again, a consideration of the export situation will be of interest. In 1911, for instance, the total exports of the United States were slightly over two billion dollars, and these increased in 1919 to about seven and a quarter billion dollars, thus increasing at a rate of about three and one-half. Turning once more to the Pacific Coast situation, again an interesting condition prevails, for our exports from these ports in 1911 totaled but ninety-four million dollars, while in 1919 they reached the enormous total of over six hundred and twenty million dollars, thus increasing to an extent of about six and one-half times that of the 1911 period. Such a situation as this shows most emphatically the strategic position

#### **The Insistent Problem in the Orient**

#### **The Growing Pan-Pacific Trade**



occupied by the great and flourishing ports of the Pacific Coast, and in this flourishing condition electrical ware and electrical apparatus unquestionably, as time goes on, will occupy a more emphatic setting.

A bill was recently passed in British Columbia, to dissolve the public utilities commission. The reasons given in the bill for the dissolution are that as there is a dominion commission, a provincial commission is an unnecessary expense, and since the majority of the public service companies have become dominion companies, they are under the control of the larger commission. This, however, does not apply to the power companies or electric railways.

The history of the public utilities commission of British Columbia shows that it has been a large factor in the development of the electrical industry in that province by allowing the power companies to charge rates that would bring them in a fair return on their investment, and allow them capital enough to carry out an extensive construction campaign. The future of British Columbia depends on the development of its resources in which it is unusually blessed, particularly its water power. These can only be developed if the investor is shown that he will receive a fair return on the money he puts into the development, and be assured that the industry he fosters will not be strangled by unwise or ignorant legislation.

A commission located at Ottawa, twenty-five hundred miles away, cannot possibly appreciate conditions as they exist in British Columbia, and cannot give attention to the little details that assure the public and the companies regulated a fair and impartial judgment—a decision that has been arrived at after hearing the arguments of both sides in person.

The fact that one great central station of the West has temporarily abandoned its plan of additional installations of steam electric units due to the increasing cost of fuel oil, emphasizes more than ever the necessity for every central station manager, executive and engineer looking into the problem of how oil may be more economically burned in the furnace.

On another page of this issue will be found the beginning of a series of articles on "Fuel Oil and Steam Engineering" that should be most timely and helpful. As a first aid to efficient and economical operation in the steam power plant generating stations, the furnace arrangement and the location of burners are of prime importance. The simplest form of oil burning furnace has the burners entering through the boiler front, the flame shooting back toward the rear of the furnace. This is the most suitable type of furnace for return tubular boilers or for water tube boilers having horizontal baffles, such as Heine or Parker boilers.

For water tube boilers in which the tubes incline downward toward the rear and having vertical passages, such as the Babcock & Wilcox boiler, a furnace

has been developed in which the burner head is placed at the bridge wall, and the flame shoots forward from there. This furnace, which is known as the Peabody furnace, was the result of an extended series of tests made by E. H. Peabody in California some years ago.

With the Stirling boiler excellent results are obtained either with the front burner arrangement or with the burners located at the bridge wall. With the former arrangement the gases come into intimate contact with the boiler heating surface. With the latter arrangement a very large furnace volume is made available so that perfect combination is obtained even at very high capacities, and as the front tubes absorb a large amount of radiant heat, excellent efficiencies are obtained. With a four-pass Stirling boiler and a Peabody furnace, still better results are obtained, for in this type of boiler there are fewer tubes exposed direct to the fire and the gases are guided down upon the remaining tubes after passing the first baffle. This arrangement, therefore, gives a combination of a large combustion chamber and efficient heat absorption.

There are many other arrangements that may be evolved in a study of economic burning of oil in the furnace for steam electric generation, and it should be the special province of each steam power engineer in our various steam electric plants of the West at the present time to give unusual study and emphasis to the search for even more efficient arrangements of burner and furnace than have existed hitherto.

The failure of the President to sign the Water Power Bill after it passed Congress is a matter of the most profound regret. As there is no assurance that at the next session Congress will pass this bill of such vital importance to the West, it should rightly be made a political issue in the next election. With the industry united in a campaign to show the voters why the passage of a satisfactory bill has a peculiar interest to each one of them, there is a reasonable certainty that congressional representatives will be elected who will actively press this matter.

A recent engineering trade review gave particulars of railroad construction between Los Angeles and Santa Barbara. It was only when the reader delved deeper into the article that he noted that it dealt with developments in Chile, not California. "The litany of the saints" is repeated in place-names along the Pacific seaboard of the Americas, from San Francisco all the way to Cape Horn.

In these days of increased friendship and interest between the peoples of the Americas, it is well to recall the Hispanic traditions of our Southwest. Cabrillo, Portola, Galvez, Padre Serra and Coronado are great names in our history. To those Spanish-speaking pioneers is due in no small measure the position our great West holds today.

#### Commission Regulation in Canada

#### Location of Fuel Oil Burners

#### Water Power Bill Fails

#### Trade and Our Hispanic Traditions



In casting up our trade balances, we shall no doubt find that such early associations with the "sons of Spain" will count in our favor in dealing with Latin America. "San Francisco" and "Los Angeles," falling in familiar cadence on Latin-American ears, are actual assets in the friendly competition for trade. And "California" is a name to conjure with, the world over.

With the traditions of the West in such full keeping with our foreign neighbors to the south, we may hope to continue in trade relations in ever-increasing ratio, and in this increase all of our great seaports of the Pacific will share. Seattle, Tacoma, Portland, and Vancouver to the north will thus come in for their portion equally with their sister cities to the south.

In passing, it is interesting to note that the Pacific Coast is taking new advantage of trade opportunities with Latin America. A special steamship service has been established between our Pacific ports and Buenos Aires, Montevideo and other Atlantic ports of South America.

A profound impression has recently been made upon the electrical industry—and this impression has even gone forth to the public at large—by the fact that recently gathered statistics show this year's business in electrical appliances and supplies to amount to the gigantic total of two billion dollars. To thoughtful men there comes with this announcement an added responsibility to the industry and to the public. Standardization of tests, and approval which should be equitable for the little fellow as well as the big fellow in the manufacturing of appliances should be insisted upon before these appliances go out to the public. These tests should bear with them a statement of the ruggedness, efficiency and the the hazard involved, and they should show the specifications under which these various appliances have been manufactured. It is a well known fact that the patent on Michrome wire under the Hoskins patent will expire in 1923. This situation gives an added emphasis to the necessity of, as early as possible, establishing some laboratory of a national character wherein these appliances may be tested and approved so that quality of workmanship will become a companion ideal to service in the industry. This is a subject that such institu-

tions as the California Electrical Cooperative Campaign, the National Electric Light Association, the Jobbers' Association, Central Stations and Manufacturers may well continue to bear in mind, and at an early date strive to get concrete, comprehensive action under way.

Recent protests have been voiced by both the residents about Lake Tahoe and by various groups of citizens in different parts of California interested in the preservation of natural landmarks, against the use of Lake Tahoe for power purposes. There is no intention of trying the rights of the present case in these columns, that being a matter for determination by the Department of the Interior which granted the permit in the first place, nor is it our province to judge between the relative values of navigation rights and power development, if indeed such comparison be involved. The interesting feature in the discussion is the minor element of protest from nature loving citizens which seems to have been made on general principles without any direct familiarity with the details and conditions of the subject under consideration.

The engineers of the country should be the last to endanger such a national asset as Lake Tahoe, and indeed so far as it appears at the present time, no such danger is threatened, only the overflow waters of the lake being involved. By all means maintain the natural beauties of the country. It might be well to go farther and protest against the establishment of amusement parks and merry-go-rounds against the background of dignity offered by the national parks. But the utilization of water for agricultural and domestic purposes and the development of power to meet the needs of home and industry are commendable projects in themselves. In their elemental necessity they possess a dignity of their own and their mention even in connection with the beauties of nature is not necessarily defiling or destructive. With the increasing density of population, the supplying of water or the providing of illumination for a large city may conceivably become more important to humanity even than the glories of a waterfall. The plea is not for the lessening of the surveillance which guards the remaining natural beauties of the nation, but merely for the substitution of sanity for sentimentality in their preservation.

## IN THE NEXT ISSUE —

The July 1st number will feature

### The A. I. E. E. Convention in Portland

General plans, program and papers

July 21-24

There will also be a review of engineering activities in the West with special reference to the work of technical organizations





Suribong Dam on the Kuron River, northern Korea. The dam is 34 ft. high and 650 long, and forms a lake 4 miles long. The face is built of even courses of cut stone.

## Construction of Suribong Power Project in Korea

BY O. W. PETERSON

(Electricity in connection with mining operations is frequently of such importance as to warrant the development of a special hydroelectric project to supply the necessary power. The following interesting account of such a development in Korea, not only gives an idea of the extent of these undertakings, but throws much light on construction practices in the Orient. The author, who is superintendent of construction with the Pacific Gas & Electric Company, had full charge of the designing and carrying out of the construction.—The Editor.)

Although the Koreans have many habits and characteristics in common with their neighbors, the Chinese and Japanese, still they have a distinct language, personality and appearance, indicating a somewhat different origin, or, at least, a very long individual development. Korea is a peninsula extending to the south of the mainland of Manchuria and Siberia, with China across the Yellow Sea to the West and the islands of Japan in the southeast. This little known land, with its outlying islands, has an area of about one hundred thousand square miles, or about two-thirds that of California. The population is estimated at about sixteen million. Korea and California are located between practically the same parallels of north latitude, but the climate of the two places is very different, the winters of north and central Korea being

long and cold, while in the south they are more moderate, due to the influence of warmer ocean currents. There is a distinct hot sultry rainy season in the summer months of July and August.

Korea was early recognized as a country rich in mineral resources, particularly in gold. The last Emperor of Korea, some twenty years ago, granted a number of mining concessions to foreigners, the first concession being obtained by an American. This property, located at Unsan in northern Korea, and consisting of an area of about five hundred square miles, was subsequently acquired by the Oriental Consolidated Mining Company, an American corporation. To date this concession has produced over twenty-five million dollars in gold from ore with an average milling value of five to six dollars per ton.

### Construction Plans

In 1918 the company found it necessary to secure additional hydroelectric power. The site of the project was on Kuron (Nine Serpents) river, twenty-five miles from the mines and about thirty miles from the South Manchuria Railroad. An over-pour masonry diversion dam of heavy gravity type, 650 ft. long and 34 ft. high, with foundations extending 15 ft. below low water level of the river, and a diversion tunnel 12 ft. by 12 ft. in section and 955 ft. long, which cut through a narrow granite ridge around which the river makes a four-mile loop, formed the principal features of this development.



The carrying of most of the materials during construction was done by human packers. These "jiggy men" walk all day with a load of 70 to 100 pounds.

between practically the same parallels of north latitude, but the climate of the two places is very different, the winters of north and central Korea being



Two short steel penstock pipes 6 ft. in diameter connect two 800-hp. Pelton-Doble turbine units with the tunnel. Direct connected General Electric generators of 600-kw. capacity develop power at 2300 volts, which is transformed to 23,000 volts for transmission over a twenty-five mile pole line to the mines. Twenty-two feet of head was gained by cutting across the neck of the bend, and nineteen to twenty-three feet additional was obtained by the diversion dam, depending on whether or not a collapsible flash-board system four feet high is in place on the crest of the dam.

It took about two months to make surveys and borings for the project, and to secure permits from the Governor-General of Korea and various minor government officials. In the meantime, private lands adjacent to the dam site and power house site were purchased and necessary equipment and buildings were hauled in by boat or packed in by cows and



Baling water out of a pit with swinging boxes. With these boxes, which were used before pumps were obtained, two men could lift one hundred gallons per minute to a height of six feet.

coolies, so that when permission to start was received a large crew was at once put to work.

#### Labor and Materials

Japanese-made cement was brought in by bull cart from the South Manchurian railroad line thirty-five miles away, four barrels weighing sixteen hundred pounds being a load. Sand of excellent quality was found in the river bed, likewise some gravel was obtained from the excavation pits. The tunnel dump was crushed to furnish concrete rock, while a quarry, just below the dam, provided granite blocks of all sizes.

Five foreigners who were able to speak Korean, four of them Americans, were obtained from the mines to act as foremen on the construction. Excellent assistance in the making of tools and equipment was given by the electrical and mechanical departments at the mines.

A small number of Korean miners, blacksmiths, carpenters, etc., from the mines acted as leaders and bosses of the coolies, a large number of whom were farmers living within twenty miles of the damsite. Altogether about five hundred Koreans were employed, the base wage being twenty-three cents for a ten-hour day when work started and thirty-five cents at the completion of the project. Skilled workmen at first received thirty-five to forty-five cents

a day and later fifty to sixty cents, the increase in wages being caused by the general world-wide advance in living costs. The above prices did not include board or housing. About two hundred and fifty Chinese from Shantung province and Manchuria were employed as stone cutters and masons at forty to fifty cents per day, and were found to be fairly industrious. Under favorable conditions the laborer in Korea has an efficiency of about one-third that of the American laborer.

The newly arrived Westerner is liable to underestimate the value of native methods of work and implements. Very often, however, these are found economical and satisfactory, particularly if there is sufficient working room and ample time. It is usually cheaper to have work done by task or contract in the Orient. There was little opportunity, however, to use this system on this project, because new classes of work, with which the natives were unfamiliar,



Early stages of the May flood. The water rose five feet higher than shown here, washing out all temporary diversion works and construction plant. The rainfall in Korea is extremely erratic.

were continually being started, and the conditions under which work was done were continually changing.

#### Human Packers

The carrying of boxes of powder, cordwood, etc., on the job was done by human packers who carry their burden on a forked frame strapped to their backs. These "jiggy men," as they are called, walk all day with a load of seventy-five to one hundred pounds. For larger loads of various kinds such as barrels of cement, machinery, timbers, or poles and big rocks, specially trained packers, well named heavy packers, who carry as much as seven hundred pounds per man, were obtained. Two men pack together, walking side by side, with a strong stick about 4 ft. long across their shoulders and necks. Rope slings are used to fasten the load to the carrying stick. The packers walk in perfect unison with rapid mincing steps, chanting as they go. At times eight pairs of packers were used on some big load. Their pay was sixty-two and one-half cents gold per day.

#### Excavation Work

The first operation in the construction of the dam, started in August of 1918, was the stripping of material above water level. This was done by the basket passers, by men with boxes on their



backs, and with light track and cars. Next followed the excavation of wet sand and gravel with some boulders imbedded. For the east third of the dam, which tied into a high clay bank, this was quite easily done. A trench was first excavated to a depth of about four feet below water level by the use of a long-handled native shovel, which dug to the decomposed granite overlying bed rock. In this wet trench a cofferdam was built of straw bags filled with clay. Crews with swinging boxes were then put to work baling the water from inside the sack levee while other gangs excavated the pit to solid bedrock.

The swinging box or water baler consists of an ordinary wooden box about 8 by 10 in. on the bottom, 10 in. deep and 12 by 14 in. across the top. To the top corners at each end ropes are attached and two men, usually seated, handle these ropes, one in each hand, with arms outstretched, dipping and swinging, back and forth, to the tune of a labor song. Ordi-

On account of the short open season free from flood, construction was continued through the winter. When the temperature dropped lower than 15° F. below zero—the lowest record was 35°—nothing but tunnel work could be done; but on days when the temperature was above 15° F., pile-driving and general construction work was carried on. This was quite remarkable since the Koreans who worked in water were barefooted, it being impossible to obtain rubber boots for them on account of the war embargo on all rubber goods. All who worked in water during very cold weather were given a silver coin, worth five cents, as a bonus at the end of each day's work.

### Work Delayed by Floods

At any season of the year in Korea erratic rainfall is liable to occur and cause unexpected floods. Two such occurrences interfered seriously with the progress of construction, one in the early fall and the other in spring. The latter caused the loss of



The power house building under construction. As floods on the river rise over twenty feet above low river level it was necessary to build masonry walls which would stand water pressure to a height of ten feet above floor line.



Intake structure in front of diversion tunnel. The tunnel is 12 x 12 ft. in section, and 955 ft. long, and is cut through a granite ridge around which the river makes a four-mile loop.

narly one hundred gallons per minute was lifted six feet by two men, and by using a team of four to six men with two or three boxes swinging in tandem, as it were, two hundred to three hundred gallons per minute could be elevated to any height. These boxes were used before pumps were obtained and afterwards for unwatering local depressions in the bedrock. This simple yet ingenious device, like many others used in Korea, is an invention of the Chinese.

### Driving Piles

Farther out in the river, where four to twelve feet of porous sand and gravel with boulders overlying impervious material, sheet piling had to be driven to secure a relatively tight cofferdam. This piling was located thirty feet outside the lines of the dam so as to leave room inside for an undisturbed bank, which, faced with straw bags filled with sand, served as a support for the piling. Some experimenting was done with hand-operated pile drivers, the hammers being raised by fifteen to twenty coolies pulling by four ropes, all to the accompaniment of a labor song. As it was soon found that this method was entirely too slow, a steam operated pile driver was built to handle a 1500-pound hammer. This piece of equipment, like all others used, had to be made on the concession.

some pumps and engines and washed out several hundred linear feet of sheet piling along with trestles, derricks, etc. As the flood subsided, trestles and diversion works were rebuilt, piling was re-driven with two drivers working in three eight-hour shifts, and unwatering of the pit was renewed with a larger pumping unit that could easily handle three thousand gallons of leakage per minute. Every means to rush excavation, concrete, and masonry work was employed, with two eight-hour shifts working from 4 a.m. to 8 p.m. without stop. Men were crowded in as thickly as working space allowed, for the regular summer flood season was due within a month. In this season, the rains amount to as much as 13 in. in twenty-four hours, producing from the 350 square miles of drainage area above Suribong a flood flow of about seventy-five thousand cubic feet per second.

### Mixing Concrete by Hand

Since it was most urgent to get the base of the dam built up above water level as quickly as possible so as to reduce pumping expense and the danger of having a flood fill the pit, concrete, which could be placed more rapidly than masonry, was used on that portion of the work. Concrete mixing was done both by hand and machine, until the flood of May,



just mentioned, washed away the only engine available for the operation of the concrete lever. Sand and rock were loaded into empty cement barrels for convenient measurement and movement to the mixing platform. On days when 160 barrels of cement were used a tremendous amount of hand labor was performed. Besides the cement, 960 barrels of rock in lots of six barrels and 480 barrels of sand in lots of three barrels, a total of 1600 barrels weighing over three hundred tons, had to be packed by Korean packers an average distance of fifty feet, besides the necessary water in five-gallon cans. With two mixing gangs at work and one extra gang resting, each consisting of fifty to sixty men, including dumpers of barrels, water tenders, etc., and with one hundred or more packers bringing in barrels of raw material, besides the two hundred or more coolies engaged in filling barrels, there was much human activity. The mixed concrete was loaded into slide-dump cars and transported to the points of use. Large rocks, slung in by derricks and carried in by packers, were imbedded in the concrete up to 20% of the entire mass. In June, 1919, such concrete operations were carried on continuously for three weeks from 4 a.m. to 8 p.m. with two shifts working eight hours without any stops. The mixing was generally done by Chinese, while all the packing and filling of barrels was done by Koreans.

The upstream top face of the dam was built of uncoursed rubble masonry while on the downstream side even courses of cut stone were laid. The downstream edge of the crest was constructed of large stone with face cut to two-foot radius. Rock for the masons was landed on the dam by derricks and heavy packers.

### Drilling the Tunnel

The diversion tunnel through the hard granite ridge was driven by hand drilling, on account of the lack of machine drill equipment and of a sufficient number of experienced operators. Three eight-hour shifts, each of which worked straight eight hours without any stop for meals or other causes, except blasting, were organized at each heading. The advance was made by a top heading six feet high and twelve feet wide, a total of about 30 holes, averaging three and one-half feet in depth, being drilled for each round or shooting.

In drilling, six men stood holding  $\frac{7}{8}$ -in. drills in the top portion of the face, while six other Koreans struck with 8-lb. hammers. The holes of the lower half of the top heading were drilled by six men on their knees holding drills four feet longer than usual, which were, in turn, hammered by six other men standing farther back from the face. By this arrangement twelve holes were drilled simultaneously in a heading only six feet high and twelve feet wide, making two men per linear foot of face. The scheme worked excellently, and progress of ninety to one hundred and thirty feet per month was made in each heading in quite hard tight rock, all of which stood without the use of timbers when opened up to full face. The bench, kept as close as possible to the face, was next taken out in two lifts with vertical holes drilled by Korean farmers who were prac-

tically experienced in such work. About twenty-five pounds of powder was required per foot of tunnel.

The river was diverted through the tunnel early in Spring, thus removing it from the dam site and lowering the water level several feet around the dam.

The penstock pipes were constructed of plates from light steel tanks formerly in use at the mines. All riveting and caulking was done by hand.

As floods on this river rise over twenty feet above low river level it was necessary to build the power house building with a watertight floor of reinforced concrete, and masonry walls that would stand water pressure to a height of ten feet above the floor line. These walls, extending several feet below floor level to bedrock, are over four feet thick at the base and two feet at the top. A thin reinforced concrete section was built on top of the side walls to make room for the crane and to carry the roof trusses. Machinery foundations and draft tubes were constructed of concrete.

The plant was finally completed in November, 1919, and recent reports tell of its successful operation.

### RAILWAY ELECTRIFICATION IN SWITZERLAND

(The current interest in railroad electrification in the West makes the following extract from a letter recently received from Switzerland of especial timely interest.—The Editor.)

The government-operated railways of Switzerland are operated on single phase, 15,000-volt alternating current. This requires the change-over of all low voltage lines in the vicinity of the railroad line to underground construction.

Insulation is tested to 50,000 volts. Both insulators and poles are painted green, so that they may not be too conspicuous.

The locomotives are much heavier than those formerly used, are faster and draw more. They utilize regenerative braking. The drive is by means of a cam which works from both motors connected through a shaft to an idler and thence to two triangles, one on each side, which are heavy discs—otherwise they break too easily. These triangles are then connected with the wheels.

The Gotthard Tunnel was to have been opened in May and the Erstfeld-Bellinzona is scheduled for December, 1920; Zug-Luzern-Chiasso in 1921; and the Basel-Zuerich-Chiasso in 1922. The stretch from Bern to Brieg is already in service.

The canton operated railroads are already two-thirds electrified. They utilize a different drive from that of the federally operated roads.

Work on the Etzel project has been begun this spring. It will cost 90 million francs and furnish power for eastern Switzerland, so that all main lines in this region can be electrified by 1925.

Several projects are now under way. In Wallis, the stream from Mt. Blanc is being developed and is known as the Barberina Project. The canton of Bern is developing Hasli Valley as far as Grimsel, where 300,000 kw. will be obtained for industrial purposes. Work on this is to start this summer.



## Reward For Efficiency

BY E. O. EDGERTON

(Constructive thought was the order of the day at the recent Pasadena Convention of the National Electric Light Association, and of the many utterances there made, none stand out more clearly in the public mind, more forcefully, than do those of E. O. Edgerton, president of the California Railroad Commission. He drove home his ideals of utility service and the possibilities of reward in such a clear manner as to give hope and inspiration for the future in matters of finance—both sorely needed in our industry today. The following is from a stenographic report of his address.—The Editor.)

I believe that in a very real sense the gentlemen conducting the public utility business today are public servants. In turning the pages of the report of the Committee on Electrical Resources, I became interested in answers to queries that had been sent out by that committee, these answers coming from California. And one of them particularly struck my attention. I was more interested in that particular answer than in any other, because the gentleman who wrote it evidently felt pretty strongly on the subject of what the Commission had done to him. And to emphasize his objection to what he conceived to be the attitude of the California Railroad Commission, he said, "This Commission must get over the idea that it represents the public." And he quoted "represents the public."

Now, my conception is that it cannot be possible fairly to operate, either on the part of the Utility Commission or on the part of a public utility, except the interests of the public be made paramount.

Let us put the converse of that to see how it would sound—that the best interests of a public utility company lay along the line of working against public interest. Now, none of us would agree to that, I take it. So the opposite must be true. In a very real sense, my eight years on the Railroad Commission teach me that what is good for the public is good for the company, and what is bad for the company is bad for the public. And the Railroad Commission proposes to proceed along that line; and so it says with emphasis that it is to the interests of the consumers and the public that these great institutions be kept sound.

### What Is a Reward for Efficiency?

Now, rewards for efficiency. I want to define this subject in my own way. I want to broaden it from a mere discussion of definite specific reward and treat it from the standpoint of inducement to do the best that is in each man who is connected with this great industry, and also finally I want to suggest inducement to the public utility commissioners to do their best.

Let us take money. By the way, for some reason or other that I have not been able to understand—and I have made considerable inquiry on the subject—finance is excluded from public discussion, as an ordinary thing. I looked over your program—and I speak in no sense of criticism—I looked over your program seeking the place where finance would be discussed, and I found nothing. Why that is so I don't understand, because today at least in California—and I think it is true over the nation—the greatest single job that we have is to finance these

public utility concerns. And why that great subject should not be pulled frankly out into the open so that the most of intellect and ability can be brought to bear on the subject, I don't understand.

If I dwell too much on California conditions, it is not in any provincial spirit, it is not in any feeling that we in this state dominate the situation in any degree, but it is first because I know California conditions better than any others, and next, because of the situation we are in. The problems perhaps are accentuated out here as compared with the East.

The job of financing these public utilities immediately ahead is a huge one. In California every time I have made an estimate of the amount of money required in the next few years, I have found that somebody raises that estimate. I started in with \$250,000,000 in the next ten years, and I have been raised now to \$500,000,000; and I don't know where it is going to end.

### Charge of Financial Unsoundness

The other day in Chicago a very famous banker was on the witness stand before the Public Utility Commission of that state, and he made this statement, published largely over the nation, that anybody who invested in public utility stock needed a guardian. I don't admit that the electric public utilities of California are financially sound, basically sound. I affirmatively assert, I insist that it is true, and I say that that statement as a generalization is unsound, and as a particularization as applied to California is particularly unsound, and that sort of statement has the effect of offsetting, in some degree at least, the efforts that are being made to build up the credits of these companies in order that the investors may have confidence and assurance. A gentleman of prominence who goes publicly on the witness stand and makes a statement of that kind ought at least to be careful that by a glittering generality he does not do serious damage, probably not intended by him.

I am one of those who believe that you cannot produce the best that is in men and women by punishment. You cannot whip a man into efficiency. In that belief I am convinced you must proceed by inducement; that every one of us in some degree, in order that he may do the best that is in him, requires that before his eyes there be some reward in some form.

### Encouraging Western Investment

Let us apply that to the fellow who has money to invest. I recognize that we cannot get money out here from the East into California by threat, by argument, by any form of punishment, by any suggestion that because of investment already made



they cannot quit; I recognize that the money must come by inducement; and in my judgment it can be induced without paying exorbitant and unreasonable prices for it. We must bid for it, yes; but bid for it against speculative securities, against anything anybody is willing to offer—bid for it against the man who offers a chance for large reward? No; I say not. But I believe that we have assets in California which, if properly used, will produce the fundamentals of inducement to investors, this being absolute security of the investment itself, the assurance that the dollar will not become 90 cents or something less, coupled with the certainty and regularity of return. And if we have these assets, why not make use of them, and then if money is available on any terms, we will get that money.

What are these assets? Power houses and transmission lines? Surely. But over and above that we have the assets of a great vital, essential service—a service which the people must have, a service which they cannot get along without. And that is an assurance to an investor that that asset cannot disappear. My judgment is that the Railroad Commission has that asset in trust for the people, and I think they can make bitter complaint if we do not use that asset, coupled with others, so as to produce the necessary money to do the absolutely essential development that must go forward in this state.

#### Insuring Investment

If it is necessary now to insure investment, to insure regularity and certainty of return, why not face that fact? Why continue to indulge in discussions of technical methods of valuation never settled? Eight years' experience now in the Railroad Commission, with constant discussion of the methods of valuation and proper rate bases and readings of the decisions of the courts, puts me in position to say to you gentlemen that those questions are no more certainly settled today than they were eight years ago. Why not face that as a fact, and why not seek some other method of determining the rate of return the company should get? To face the situation clearly and conscientiously, what methods now shall we pursue?

#### Sound Capitalization

The sound thing to do is to start with sound capitalization—an admitted, agreed, established capitalization; and thereafter fix rates based on getting the necessary bond interest, dividends, and fixed charges to support that investment, and then to meet the contention of the investor that perhaps later a different policy may be adopted, set up a cash reserve out of rates, to be rigidly held, for the purpose of insuring bond interest and dividends, so that when you go to market your securities in the money markets of the country, the investor can be shown an actual cash reserve as an insurance policy for his bond interest and principal. I realize that this suggestion means almost a complete reversal of the attitude of regulating bodies towards this question. But why not? If it is the sound thing to do, why not reverse the attitude?

I make these suggestions in no spirit of finality. If there is one thing I have learned, it is that final opinions are never final. But I do make them for the purpose of starting discussion on this important subject. If those suggestions are not sound, weaknesses may be pointed out, and I for one will welcome such suggestions. I welcome criticism of regulation in California, only providing that the fellow who criticizes me accords to me the same thing that I accord to him, and that is sincerity of purpose.

#### Degrees of Efficiency

Are all the electric public utilities at the highest point of efficiency? Well, they are not all here, so we can say they are not, and I think we can conclude that there are different degrees of efficiency among the companies. It is sound to suggest that inducements definitely be held up to the companies to become thoroughly efficient. I think it would pay the public to hold up definite rewards to that end. And incidentally that suggestion has been made quite frequently to our Commission and others. There is a feeling that regulation has a tendency to hold the return down to a dead level, that the inefficient company enjoys that rate of return and that the efficient company enjoys it no more, no less, and that its initiative in a sense is destroyed. Why work, toil, think, to produce efficiency if the regulating body immediately grabs it off in rates? A very fair suggestion. But this is to be thought of: Whom must you reward to get the efficiency?

If you have taken care of the investor, if you have produced a situation where his investment is safe and intact, his return is regular and sure, must you stimulate him to make him efficient? That is not quite what we are thinking of. Then who is it that we should stimulate by offer of reward? In my judgment, it is the organization of the company itself, and when I say "organization" I mean from the president to the office boy. I don't believe it produces efficiency merely to hand the management, as such, the reward; in fact, I am inclined to think that that would produce the opposite effect, because down through the organization would go the feeling that the reward earned by each individual's efforts was going to some one else, and there is not anything in the American mind that produces more resentment than such a situation.

The regulating body ought to give definite assurance that for increased efficiency and economy, always coupled with good service, a reward should be accorded by the regulating body representing the people. The job thereafter is distinctly one of management to make that effective. A management to make it effective must see to it in some efficient way that every member of the organization, no matter how humble, is made to understand in a convincing way that his increased efforts towards efficiency and economy will be rewarded. I speak not only in a money sense, but also of recognition of service well performed by men lower in the ranks; I speak of certainty of advancement when opportunity comes; I speak of the absolute elimination of pull or influence in the advancement in the organization; I speak



of a situation where the management itself studies its personnel and constantly works at the problem, to know what its personnel really is, to know when efficiency and economy are being striven for by the individual in the ranks, and then with absolute certainty to reward that effort on the part of the members of the organization. Is this being done? It is not. As to some of you, yes; but still again they are not all here, so they are not all doing it.

I have had clerks telephone me from the inside of public utility organizations, fearful to give their names to me, to urge that the entire class represented by the speaker over the telephone had been overlooked in the wage increase, and that the wage increase had been given in large part to the organized employees. And in that clerk's heart was the sense that because of the organization, because of the threat held up to the management, additional wages had been accorded and merit had been forgotten. And there is not a more dangerous mental condition in the human mind than to feel that the only possibility of getting a reward is to swing a club.

### Solving the Labor Problem

There is no better way to solve the question often called the labor question—there is no better way to take the body of labor, working people, clerks, away from the demagogue leader of the union than to accord every individual in an organization rewards for efficiency. It is the best safeguard against the chap who comes about preaching anarchy, preaching this proposition, "You are not getting a square deal." What better safeguard could there be than to have in the heart of the fellow he comes to, the knowledge that he is getting a square deal? That is better in my judgment, than any panacea that has been suggested; but it requires work and study, and I am not prepared to suggest definite methods of carrying this into effect. I believe it requires, on the part of the management, work, thought, study, effort. Is it worth that effort?

I remember talking to one of the directors of a company that is generally considered—and I think properly so—one of the most efficient in the United States in the matter of organization. It is generally understood that the employees of that company seldom quit. I began to be interested to know why, and so I talked to one of the directors. In a few words he explained the system. He said: "It is the job of the highest officers in our company, it is their principal job, to study, to watch, to investigate, to come in contact with, all of the employees of the company. A rigid rule is adopted that promotions are made upon merit, that in no instance is an outside man called into the organization, except the organization itself has not one of the special knowledge required at the moment; that men starting with the company have an assurance of a career for life, and that they have the assurance that they will be constantly promoted as opportunity offers." I said to him, "Well, if this is the job of the principal officers of the company, how do you find time for the ordinary business of the concern?" He said, "If our organization is efficient, the business takes care of itself. In other

words, we sharpen the tool, and we have the confidence thereafter that it will cut. We don't have to worry."

### The Railroad Commission

The Railroad Commission also requires efficiency. We are the same kind of animals as you fellows—no different. The job is a little different—true; but in a real sense we are wrapped up in your success, will suffer by your failure. Remember, if the private ownership and operation of public utilities goes down in failure, regulation goes down with it. No matter whether the Commissioners can point the finger of blame to the utility men, if the wreck occurs, regulation has failed.

So you fellows owe a duty to the public utility commissions. You should hold up the reward for efficiency on their part. And the only reward that you have available is to make regulation as little necessary as possible, that you yourselves really put into effect the things outlined by Mr. Kennedy in his very able paper. Beat the regulating body to it, and you will do the best thing you can for the regulating body. By the success of your own efforts in satisfying the public will you make the job of the utility commission a job worth having.

It is a cheap and easy thing, and sometimes results in temporary glory, for commissioners to denounce public utilities; but it is in reality a very costly thing, for the companies and for the commissioners, because finally a denunciation goes to the point of wreck, as I said, and regulation and commissioners go down with the wreck.

### Necessity of Hydroelectric Development

And finally, may I say this from the standpoint of California? There is a tremendous job ahead—a job for the electric utilities, a job which involves not only carrying forward the business which naturally accumulates, which normally increases, but the unquestioned job of taking over the work now being done by oil out here. There is not another substitute in sight for oil except hydroelectric energy; and it is a sobering thought to think of the tremendous responsibility which that will place upon the electric utility men of this state and the Commission with them. When you stop to think of a state like California, with agriculture, industry, and the people absolutely dependent upon the efforts of you gentlemen to produce service, think of the responsibility that you not only ought to take upon your shoulders, but that you will have to take upon your shoulders.

### Value of Frank Discussion

Realizing that, I make this suggestion, that it is the wise thing to approach this whole problem with an open mind, without any fear whatever of disclosing secrets, withholding information, striving for advantage, this company against the other, in order to solve the problem in a way that will be sound, considering the whole power situation. I believe the proper position for both the companies and the Commission to take is that it is one great problem, and that it is not sound operation on the part of the companies to allow one company to be seri-



ously injured, because that injures the industry as a whole.

I am not suggesting this, but why not discuss it? If today this great job be to get it financed—if to produce the service under the conditions that must be accorded the people, it is necessary to consider complete unification of these plants, why not discuss it? I say the man who is afraid openly and frankly to discuss that subject is fearful it may succeed. Why will the fellow who believes that there is an inherent fundamental weakness in unification not come forward and discuss it with anybody, in the conviction that he can defeat the suggestion?

I only suggest that because I know it touches the heart of the fellow who has built up a company, who has been with it in fair weather and foul, and has a pride in that company, in its giving service and in its entity. I know that, being a human being, he does not like to merge that company with another. I know that he feels he is giving good service, and he is reluctant to consider the unification with other

companies that he thinks are below him in the standard of service.

But why not discuss it? If it is the answer, then I say the personal feelings of each of us must go by the board. The great thing to accomplish is the doing of the job, and finally the public will hold us responsible for having the job done. They do not understand all the angles of it. The public of California today, if you suddenly said, "Let us put all the companies together under one great organization," might rebel, because they would not understand what it meant; but that does not exclude us from going forward with the discussion to see whether it is sound. It won't do for us later to say, "Well, you don't want us to do it." My conception finally is that the electric public utility men, with the utility commission, are in responsible charge of doing the job. We must do it efficiently, and then we are entitled to our rewards. If we don't do it, we ought gracefully to take what undoubtedly will result.

## Service of the Business Press to Foreign Trade

BY JAMES H. McGRAW

(In the Pan-Pacific field the question of international relations and their effect upon trade and national prosperity is of ever-increasing importance to the electrical industry. The vital part which the business press plays in the establishment and development of healthy international relations is here analyzed by the President of the McGraw-Hill Co., Inc., in excerpts from an address delivered before the recent Foreign Trade Convention.—The Editor.)

Foreign trade to hundreds of manufacturers in this country has been a name only. It is trite to say that the average American manufacturer has thought only in terms of his domestic business for so long that it is usually the exception, rather than the rule, for him to be thoroughly familiar with his opportunities and his responsibilities with regard to foreign trade.

### Molding Public Opinion for Foreign Trade

The development of a better understanding of our foreign trade needs and our foreign trade responsibilities is an educational movement, and through the medium of the business press the manufacturers may learn in detail in their several industries something of the opportunities for trade extension in their particular fields.

There are two broad classes of business journals in this country which are functioning to help meet this great problem. First, there are those journals published in this country whose circulation is primarily in the United States. It is the function of these journals to take up the problems of the American manufacturer as an exporter of goods in connection with the other problems that they present to him, and this large group of business papers can do much to arouse the manufacturer to his opportunities in the foreign field.

Then there is a large group of journals which are published in this country, but are presented from the viewpoint of the foreign buyer and the importer in other countries, whose circulation is found in the countries outside of the United States. These papers are printed in different languages, and concern them-

selves fundamentally with the problems of the buyer of American goods, rather than with the problems of the seller of American goods.

### Three Functions of the Business Press in Reference to Foreign Trade

There are three directions in which the business press can function in reference to foreign trade. It can

1. Assist in awakening the business man to the effect of foreign trade as a stabilizer, and of its necessity as an outlet for indefinite increase of our industrial production;
2. Gather and publish information regarding the conditions in foreign lands which affect our trade opportunities; and
3. Spread the knowledge of American goods in foreign lands.

The need for exercising the first of these functions—the awakening of the business man to the stabilizing effect of foreign trade and of its necessity as an absorbent of surplus production—is still one of very great importance indeed. It has been the theme of many a paper before foreign trade gatherings. Nor is it necessary to emphasize again the reason why the business press has a special mission in this regard. That has been amply developed in the introductory remarks to this paper.

It is pertinent to point out, though, that foreign trade will never become the factor it should be in the commercial life of this country until there is a "mass movement" into export trade. This must be preceded by an understanding of its importance, and then accomplished by intelligent cooperative effort. The relatively small corporations, as well as the few dominant ones in each industry, must sell goods abroad. The mass movement should receive its greatest stim-



ulant through the sort of educational work for which the business press is particularly fitted. Even a business paper with as small a subscription list as 5,000 reaches far beyond the confines of the dominant corporations in its industry and is in a position to preach the doctrine of foreign trade to every organization with strength enough to engage successfully in export work.

### International Sympathies

Nor is educational effort along the lines of the effect and advantages of foreign trade alone sufficient to bring about the result we desire. It is necessary to awaken international sympathies and to create international thinking in all lines of business. We must break down the insular barriers in both our thinking and our action. They will not fall easily, but only after constant hammering and bringing to bear every resource of fact and logic.

Moreover, while we are working toward the desired goal, the business press can do yeoman service in bringing heavy influence to bear on specific issues. For example, when the Appropriations Committee of the House of Representatives in February cut the appropriations for our foreign trade promotion work, the business press in every line pointed out the certain serious effect of such curtailment and urged upon its readers the expression of their views to their representatives in Congress. The need for crystallization of views on such issues will occur constantly, and the business press can be counted on to do its part in unifying opinion and securing action.

### Information Regarding Conditions Abroad

Until recently, the business press has functioned mainly in relation to domestic affairs. Since 1914, however, there has been a rapid increase in the variety and intensity of business paper effort on foreign trade, and, as you well know, it has been a very potent factor in stimulating interest and activity in this trade.

There has been a very lively recognition by the business papers of the importance of foreign trade news, and through slow and difficult sources of information much has been accomplished along these lines. From now forward the task will be easier.

The reason for our former neglect of foreign trade interests is obvious enough. The vast volume of our trade in manufactured goods has in the past been largely domestic, and our business papers, serving their field, were satisfied to act as purveyors of information regarding domestic conditions and developments only. But as American business takes on an international scope, so must the business paper expand. It will no longer do to be concerned with domestic conditions only. World conditions must be interpreted. The American manufacturer and merchant must be able to get from their business paper the same sort of information regarding foreign trade that they now get regarding domestic trade.

One vital way in which the business press is functioning in connection with the promotion of a better understanding of foreign trade is to bring to the attention of the American manufacturers what is being done by competitors abroad who are seeking the same markets.

More than that, because of the close association that exists between the business press and its own clientele there has been on occasion the opportunity to emphasize the mutual values of import and export relations between our manufacturers and the manufacturers abroad. Because the business paper is close to its field and because it sees the necessity for making first-hand studies and investigations of situations, it has an unique opportunity for leadership in the establishment of a better understanding of export or import trade relations of our own manufacturers or consumers.

### Spreading Knowledge of American Goods Abroad

The third function of the business press is to act as an advance agent for American goods abroad. In this respect, the business press already has an enviable record—a record stretching back a score of years. Business paper reading matter, as well as advertisements, are constantly stimulating sales of American goods and machinery abroad. Tales are common of even heavy machinery ordered by cable on the sole basis of a business paper description, record of performance, or advertisement.

This foreign propaganda function was a by-product, not stimulated prior to 1914. No attempt was made to secure foreign subscriptions. They were bought, not sold. Since 1914, a new attitude has developed and publishers of business papers are making, and will continue to make, the strongest efforts to put their periodicals into the hands of influential foreign readers.

Nor are these efforts confined to placing our American editions in foreign hands. Special foreign editions are being printed in a number of instances, while several new business papers, printed exclusively in foreign languages, have been established.

Although the great work of the business press in its relation to foreign trade has only just begun, it is safe to say that every business paper in the United States is awake to its opportunities, its responsibilities and its duty. The general recognition of these factors is already in evidence—the final form into which action will crystallize is yet to be reached. It is too true that their preliminary work has not been above criticism. But they, too, have suffered from the inertia that has characterized the general attitude of our business men toward foreign trade, though in justice it must be said that the more progressive of them previous to 1914 tried preaching a doctrine which they knew to be sound, but which apparently fell on deaf ears. Now, with the business mind in a more receptive mood, they are improving through mutual criticism and appreciation, preaching the doctrine of the stabilizing influence of foreign trade, throwing light on pertinent foreign conditions and going forth to spread in foreign lands the knowledge of American goods and equipment.

And where American business goes, it will find the American paper already in the field. For it is as a herald and a pioneer that the business papers pledge themselves today to the service of the export trade of the United States.





#### PROGRESS IN THE ORIENT

(1) and (2) Old and new China: railway stations at Hang Chow on the Shanghai, Hang Chow and Ning-poo Railway. (3) Entrance to native city of Zeh-kan, China. (4) Nippon Electric Company Works, Tokyo, Japan. (5) Main Exchange, Shanghai Mutual Telephone Company, Shanghai, China.



## Power Developments in Scandinavia

BY J. W. BECKMAN

(The Pacific Coast states, owing to their somewhat similar topography, have a water power situation very like that of Scandinavia. The following article is of special interest to those concerned in the fullest development of Western water power resources, and constitutes a valuable basis of comparison. The author is a member of the Beckman & Linden Engineering Corporation.—The Editor.)

Due to various circumstances, such as legislation, and due to the mental lethargy of the American people—encouraged to a great extent by the availability of cheap sources of energy other than water power—hydroelectric developments have tended to be overlooked and neglected in this country, especially when compared with similar power sources in other parts of the world.

It is often stimulating to see what other people have done along a special line and it is just as often encouraging to see how seemingly insurmountable troubles have been overcome when there was an intelligent public behind an undertaking. The two Scandinavian countries, Sweden and Norway, have been pioneers in hydroelectric development, and it would seem that it might be of interest to get an insight into developments there.

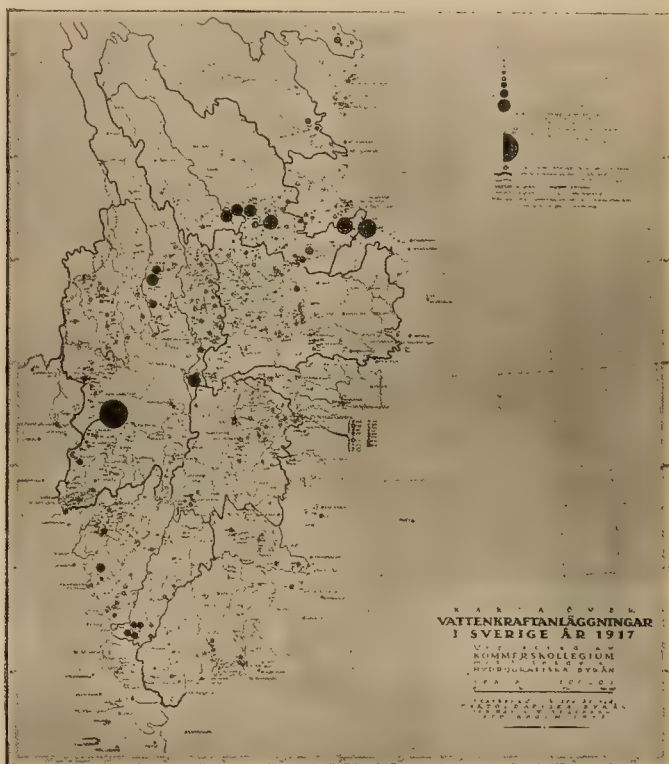
We, in the United States, compared with Norway, are very backward in the development of our hydroelectric possibilities. In our country we have unutilized power possibilities such as Norway never has had. There is no reason to deny that Norway has had some extremely cheap power installations, but in many cases, and perhaps in all of them, the consumers who wanted the cheap power had to move into a desolate wilderness or to an isolated point on the coast line and there install the consuming industry.

### Transmission Difficulties

It might be supposed that the power could be transmitted from the generating station to a suitable point for consumption, but in many cases the formation of the country prohibits such transmission lines, snow-capped mountains, glaciers and climatic conditions forming barriers which often render long distance transmission impossible. These are some of the factors which determine the building of hydroelectric plants for industrial purposes, and without knowing all the details connected with the Norwegian developments, it is impossible fully to comprehend their locations. It can be said, with a reasonable amount of correctness, that the larger, readily available, cheap power developments have all been taken up and are utilized for industrial purposes—electrochemical, electro-metallurgical, as well as in the manufacture of wood products.

The estimated average cost of installing hydroelectric power in Norway today is 700 Norwegian crowns, or in dollars—with normal exchange when \$1.00 equals 3.75 crowns—\$194 per installed kilowatt. The investing public of Norway may be satisfied with a lower rate of return than that of the United States, since this power is obtainable at the bus bars at \$19.41 per kilowatt year—a price which supposedly covers all costs such as depreciation and amortization of the plant, as well as operating ex-

penses. The transmission cost is apparently large since the average price of power at the end of a transmission line is \$29.38 per kw-yr., while the charge of power to the small consumer through a distributing system is \$53.33 per kw-yr. Even these figures are low compared with prices charged under similar conditions in the United States. None of the



Map showing water power developments in Sweden. For developments above 25,000 the circles are proportionate to the installed capacity.

transmission lines in Norway are of any unusual length.

### Industrial Uses of Electricity

The water power developments in Norway have a most interesting history, and indicate what a financially poor country with a small population can do if it is fully brought to realize the advantages Nature has placed in its grasp. Here it is worth mentioning that industrial developments of all kinds in the Scandinavian countries are due, to a great extent, to the daily papers, which are keen and eager to give to their readers authentic articles on technical and scientific matters—the only way by which a true public interest can be created for the intelligent industrial development of the country.

The first use of Norwegian water power was for the operation of grist mills, flour mills and saw mills. The annual development of water power for such purposes has gone slowly forward at the rate of about 1,500 hp. per annum.



In the seventies the mechanical paper mills were started and later the chemical paper mills were introduced, giving a fresh impetus to the water developments. Between 1895 and 1915, the average annual water development due to the paper industry amounted to 15,500 hp.

In 1895, 700-800 hp. electric energy was generated by water—the birth of hydroelectric developments. During the following five years the total increase of water power developed for the production of electric energy amounted to 15,000 hp., or an average increase of 3,000 hp. per year. During the following five-year period 40,000 hp. of water-generated electric energy was installed, and there was an average annual increase of 8,000 hp.

160,000 hp. additional electric energy was placed in operation during the five-year period from 1905 to 1910, averaging an annual increase of over 30,000 hp.

It is of especial interest that simultaneously with the increased demand for water power for the purpose of generating electric energy, the water had also been utilized in ever increasing amounts in the paper industry, and in 1910 the two interests, the electrical industry and the paper industry, were consuming about the same amounts. 214,000 hp. were used by the paper industry, while for the generation of electric energy 213,000 hp. were operating.

At that time one-third of the electrical energy generated was used for domestic purposes, and two-thirds were absorbed by industrial demands.

During the following eight years Norway has made enormous strides in the electrochemical industries and, consequently, the growth of the power generating industries has been stupendous. In 1910, 15,000 hp. were consumed in electrochemical industries, while in 1918, 770,000 hp. operated on these industries. The domestic demand for power has not grown at all in proportion with that of the industries, and is represented by a very small percentage of the total today.

Small Hydroelectric Developments

Sweden is a strip of land approximately the same size as the Pacific Coast states of the United States, dotted throughout its length with various industries which have developed their own source of power as one of the inherent parts of the industrial activity. A new industry contemplating starting operation in this country makes its first question, "Where is the nearest power line?" while in Sweden and Norway under the same conditions the question is, "Where is the nearest power source that can be developed?"

The result of this attitude in Sweden is indicated by the following official tables of 1913 and 1917, showing use of developments and number of developments in Sweden, and illustrating in a marked way the position of the small developments.

Size of Equipment in Turbine Hp.	1913 Number of Plants	Total Number of Turbine Hp.
50,000 or more	1	80,000
25,000—50,000	2	68,000
10,000—25,000	6	109,000
5,000—1,000	18	116,000
1,000—5,000	126	245,000
200—1,000	296	132,000

Size of Developments	1917 Number of Installations	Turbine Hp.
0—999 Hp.	618	171,503
1,000—1,999	78	110,701
2,000—2,999	29	69,382
3,000—3,999	14	46,690
4,000—4,999	13	58,735
5,000—5,999	10	55,250
6,000—6,999	2	12,515
7,000—7,999	3	22,510
8,000—8,999	3	25,260
9,000—9,999	1	9,530
10,000—10,999	2	21,100
12,000—12,999	3	37,000
18,000—18,999	1	18,610
20,000—20,999	1	20,000
21,000—21,999	2	42,800
22,000—22,999	1	22,950
24,000—24,999	1	24,360
32,000—32,999	1	32,800
42,000—42,999	1	42,000
56,000—56,999	1	56,240
75,000—75,999	1	75,525
129,000—129,999	1	129,625
	787	1,105,096

The following table indicates the uses the power was put to in 1913:

	No. of Turbine Hp.	%
Iron industry .....	215,000	29
Paper and pulp industries.....	240,000	32
Textile industries .....	40,000	5
Electrochemical industry .....	90,000	12
Power—distribution and miscellaneous	165,000	22

Very radical changes have taken place since then in the Swedish iron industry as well as in the electrochemical field.

Electric pig iron manufacture has grown rapidly and 70,000 hp. are used in these furnaces alone. The consumption of electric energy for electrochemical manufacture in Sweden in 1917 was 126,000 hp. and has grown considerably since then.

It may be interesting to compare the water power reserves of the Scandinavian countries—the two European countries that are most richly endowed—with those of the United States of America. The figures are given in the table below.

ESTIMATED POTENTIAL WATER POWER		
	Million Hp.	Hp. per 1000-Inhabitants
Norway .....	7.5	3020
Sweden .....	6.2	1050
United States (approx.).....	54.0	490

As to developed water power, comparative figures are still more interesting, as shown in the accompanying table.

DEVELOPED WATER POWER			
	Population (millions)	Total Dev. Hp.	Hp. per Inhabitant
Norway .....	2.5	1,250,000	.5
Sweden .....	5.5	1,100,000	.2
Oregon	5.0	941,000	.188
Washington California			

If hydroelectric power were developed at the same rate on the Pacific Coast as in Norway, 2.5 million horsepower would be developed which would mean that close to one-quarter of all available power was working producing energy there.

The Scandinavian countries suffer in a marked degree from shortage of fuels. Wood is practically the only native fuel source, and as an energy it is practically prohibited. On this account water power developments are of primary importance there. In the United States of America coal and oil have been plentiful, but here as in all other parts of the world the true conservation is that which is applied in the Scandinavian countries, making the "White Coal" work by the fullest development of all water power sources, both big and small.



# California Precipitation

BY ANDREW H. PALMER

(Rainfall in California is now, in all probability, complete for the present season, and the following article—the second half of which will appear in the next issue—includes a complete survey of data which could only be touched upon in an article on this important subject published earlier in the year. The author is Meteorologist with the U. S. Weather Bureau.—The Editor.)

When a state is so largely dependent upon precipitation as is California, rainfall data attain the importance of vital statistics. The water problem in California, as in most states lying west of the Mississippi River, is of great economic importance. The East has no water problem comparable in magnitude

Within the state are also included the region of greatest known snowfall in the United States, and regions in which snow of measurable amount has never been known to fall. There is a general increase in average precipitation from the southeast to the northwest. Moreover, the mountains are regions of heavy precipitation, while the interior basins and the southeastern plateau regions receive deficient precipitation. Records show that there is an increase in average annual precipitation up to a height of 5,000 feet in the Sierra Nevada, and a decrease above that height. While there are many exceptions, the rate of increase up to 5,000 feet in elevation is about 8.5 inches per annum for every thousand feet.

## Unequal Distribution of Precipitation

The ultimate source of practically all the precipitation in California is the Pacific Ocean. As the moisture is brought in by westerly winds, the eastern and northeastern slopes of the mountains receive much less precipitation than the western and southwestern slopes. The precipitation is unequally distributed throughout the year, winter being the wet season, and summer the dry season. Toward the north the distribution of rainfall through the year becomes more nearly equalized. In southern California about 90 per cent of the annual precipitation occurs during the winter half-year, while in northern California the proportion is about 75 per cent.

The heaviest recorded precipitation for a calendar year in California is 156.90 inches, which occurred in 1911 at La Porte, Plumas county, altitude

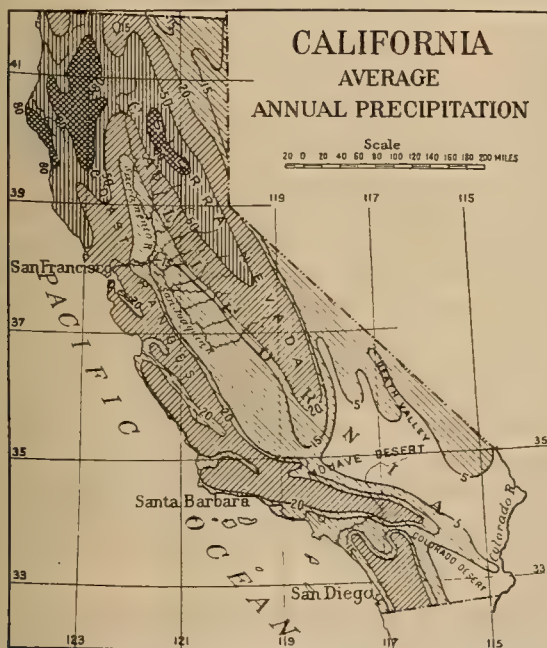


Fig. 1.—Map of California showing average annual precipitation in inches. It will be seen that there is heavy precipitation in the mountain regions and very little in the interior basins and the southeastern plateau regions.

with that of the West. As pointed out by Dr. C. E. Grunsky, in his interesting paper, "Some Notes on California Rainfall," published in the March 1 number of the Journal of Electricity, in no other state does the public watch the rainfall statistics so closely as in California. The water provided by the springs, streams and wells of California has aptly been termed the life-blood of the state.

Precipitation is the technical term universally employed by meteorologists to include rain, melted snow, hail, sleet, dew and any other moisture which reaches the ground in measureable amounts. The unit of measurement in the United States is one hundredth of an inch. For example, when the precipitation on any day is recorded as 0.06 inch, it means that moisture was precipitated to the ground in an amount equivalent to a layer of water 0.06 inch deep. It is also of interest to know that a precipitation of 0.01 inch is equivalent to slightly less than one ton of water to the acre.

As indicated in Figure 1, the average annual precipitation in California ranges from one or two inches per year, in the Mojave Desert, to more than 80 inches per year in the Sierra Nevada Mountains and in the northern portions of the Coast Range.

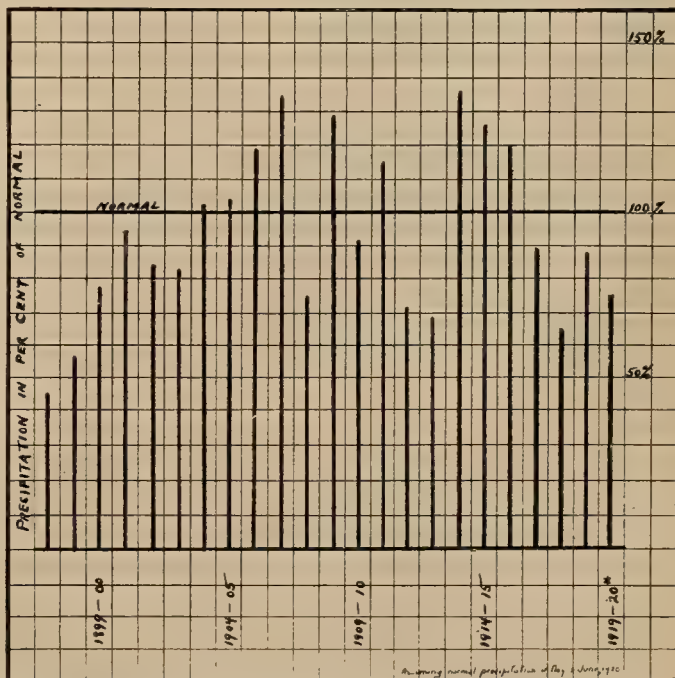


Fig. 2.—Diagrammatic presentation of the percentage figures in Table I, showing the average precipitation for about 300 stations in California from 1899 to 1920.



5,000 feet. Nearly every year at one or more stations precipitation is recorded exceeding 100 inches. As the greater part of the annual precipitation is recorded during six months, extraordinary amounts sometimes fall within short intervals. The greatest amount recorded in one month is 71.54 inches, which fell during January, 1909, at Helen Mine, Lake county, altitude 2,750 feet. The greatest amount recorded in 24 hours is 16.71 inches, which fell January 16-17, 1916, at Squirrel Inn, San Bernardino county, altitude 5,280 feet. At Campo, San Diego county, altitude 2,543 feet, 11.50 inches of rain fell in 1 hour and 20 minutes, on August 12, 1891.

By way of contrast, consider the record of Bagdad, San Bernardino county, altitude 784 feet, where no measurable rain fell from October 3, 1912, to November 8, 1914, inclusive, a period of more than two years. At Indio, Riverside county, 20 feet below sea level, no measurable rain fell from November, 1893, to January, 1895, a period of more than a year. At several stations in the Imperial Valley and at one in Death Valley, both of which depressions are below sea level, there have been periods of a year or more in which less than an inch of rain fell.

### Importance of Snowfall

Since most of the precipitation comes during the winter season, the elevated portions of the state have abundant snowfall. Tamarack, Alpine county, altitude 8,000 feet, has an average winter snowfall of 43.4 feet, based upon a record of eight years. Nearly all the stations in the higher portions of the Sierra Nevada Mountains receive more than 100 inches of snow every winter. The greatest amount recorded during one winter is 73.7 feet, which fell at Tamarack during the winter of 1907-7. From 40 to 50 feet of snow has been known to accumulate on the ground at one time in the high Sierra Nevada. The importance of this snowfall has been pointed out by

Professor R. DeC. Ward, president of the American Meteorological Society, in an article entitled, "Mean Annual Rainfall of the United States," in the Monthly Weather Review of July, 1917:

"The Sierra Nevada Mountains well deserve their name. To them California owes much, if not most, of her present prosperity and her promise for future growth and development. The many feet of winter snowfall which accumulate on the upper slopes mean millions upon millions of dollars each year to the farmers and fruit growers of southern California. Were all this precipitation to fall as rain, every winter would witness devastating floods, and every summer would wither and destroy the crops."

As may be surmised from the foregoing, California has a water problem of great complexity. The foundation of it lies in the nature of the precipitation—its irregular distribution both in time and place. Irrigation, floods, city water supply and hydro-electricity are all intimately related subdivisions of the general water problem. When the precipitation is markedly deficient, as it has been during the season of 1919-20, the water problem becomes pre-eminent.

### The Deficient Precipitation of 1919-20

As the summer half-year is the dry season, and the winter half-year is the wet season, it is appropriate to consider the seasonal year as extending from July 1 to the end of the following June, and not coinciding with the calendar year.

Precipitation data for the seasonal year 1919-20 are now available to the close of March, 1920. As 88 per cent of the seasonal precipitation normally occurs between July 1 and the close of the following March, little additional rainfall may be expected during the remainder of the season under consideration.

The Weather Bureau maintains about 300 well-distributed stations in California where rainfall data are obtained from standard instruments. Based upon records kept at these stations, the average precipita-

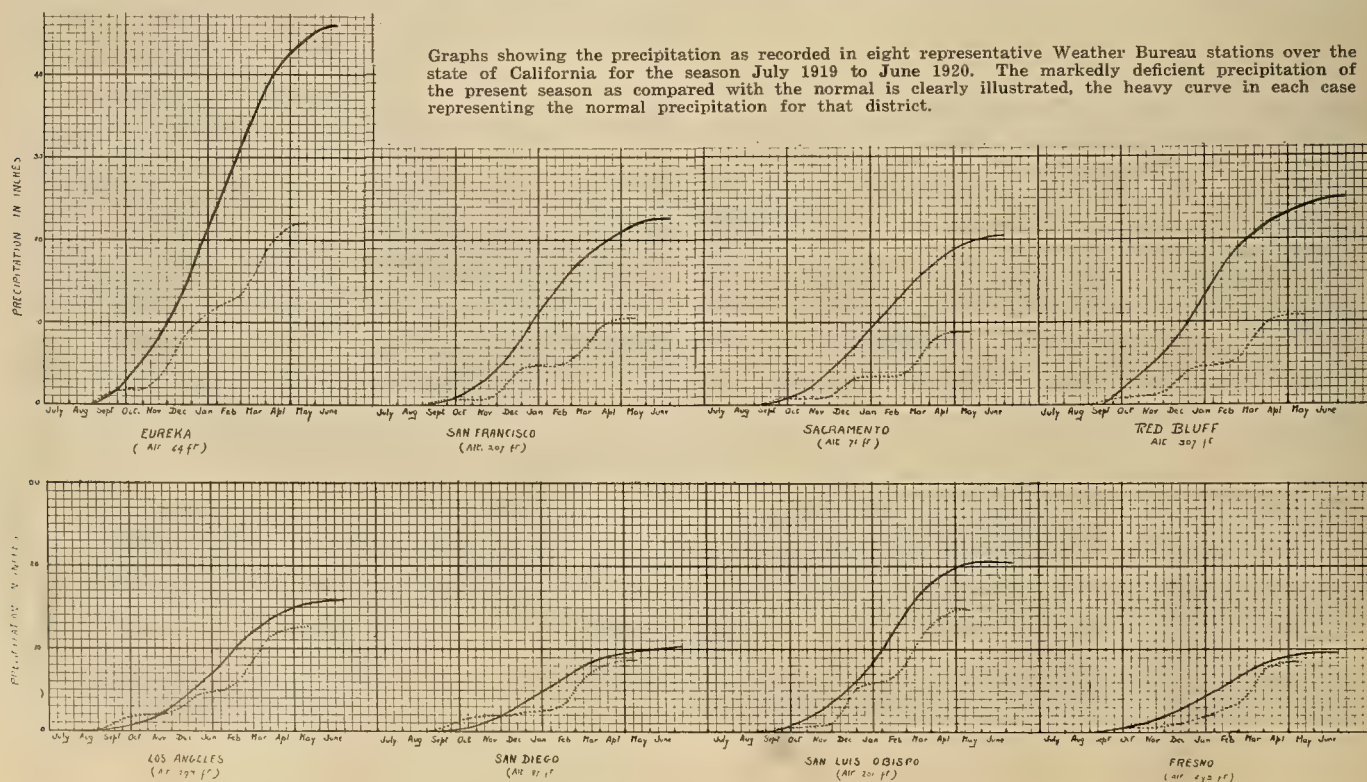




TABLE I  
Seasonal Precipitation in California, 1897-1920.  
Averages of about 300 stations.  
Normal is 26.78 inches.

Seasonal year (July-June)	Average Precipitation (inches)	Percentage of normal
1897-98	11.93	45
98-99	15.42	57
99-00	20.83	77
1900-01	24.92	93
01-02	22.40	83
02-03	22.10	82
03-04	27.36	102
04-05	27.60	103
05-06	31.98	119
06-07	35.82	134
07-08	20.10	75
08-09	34.47	129
09-10	24.43	91
10-11	30.76	115
11-12	18.90	71
12-13	18.50	69
13-14	36.37	136
14-15	33.69	126
15-16	32.12	120
16-17	23.85	89
17-18	17.54	65
18-19	23.59	88
19-20*	19.92	74

\*Assuming normal precipitation in May and June, 1920.

tion for California has been found to be about 26.78 inches. That figure is considered the normal seasonal precipitation. In Table I are given figures showing the average seasonal precipitation for California for the past 23 seasonal years, and the percentage of each as compared with the normal. These data are shown graphically in Figure 2.

The season 1919-20 has been one of the most remarkable on record, and in some respects it is the most extraordinary. A brief review of the season is worthy of consideration.

October, the month which usually marks the advent of the rainy season, brought deficient precipita-

tion, the average for the state being but 43 per cent of the normal. What little rain fell was limited to the mountain and plateau regions. Cold, dessicating, northerly winds prevailed throughout the state.

Unusually cold and dry weather occurred in November. The average precipitation for the state was but 32 per cent of the normal. Some snow fell in the Sierra Nevada Mountains near the close of the month, but the total snowfall was everywhere less than normal.

Temperature and precipitation were both below normal in December. Snowfall in the mountains was light. At the close of the month the accumulated seasonal precipitation was everywhere deficient, the deficiency being most marked in northern and central California, where less than one-half of the normal precipitation had been received.

The driest January on record in California is that of 1920. At some stations where records of 70 years were available, no January has brought less precipitation. Four stations received no measurable rainfall. The average precipitation for the state was 0.85 inch, but 16 per cent of the normal. This is usually the wettest month of the year, the normal precipitation being 5.41 inches. At the close of the month the accumulated seasonal precipitation was about 40 per cent of the normal in northern and central California, and about 50 per cent of the normal in southern California. Snowfall in the mountains was markedly deficient, and at all elevated stations from which reports were received there was less snow on the ground at the close of January than at

TABLE II.  
ACCUMULATED SEASONAL PRECIPITATION IN INCHES

Normals—Upper figures.

Season of 1919-20—Lower figures.

STATION	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Eureka.....	.11 .01	.21 .02	1.32 1.54	3.97 1.78	9.64 4.77	16.89 9.10	24.52 10.97	31.55 13.03	38.52 18.78	42.45 21.92	45.00	46.05
Fresno.....	0 0	0 0	.27 .29	.99 .58	2.02 .62	3.55 1.51	5.15 2.20	6.48 3.52	8.24 7.66	8.95 8.20	9.58	9.68
Kernville.....	.19 0	.27 0	.48 0	.91 .12	1.68 .51	2.69 1.81	5.06 2.83	7.47 4.53	8.71 8.21	9.10 10.48	9.55	9.58
Los Angeles.....	0 0	0 0	.06 1.29	.83 1.85	2.31 2.31	5.21 4.30	8.05 4.80	10.96 7.12	13.96 11.37	15.09 12.41	15.57	15.64
Quincy.....	.10 0	.23 0	1.52 3.49	4.20 3.82	9.31 4.52	15.29 11.34	25.62 11.86	31.62 15.26	38.54 23.80	41.00 28.37	43.24	44.00
Red Bluff.....	0 0	.02 0	.82 .66	2.40 1.02	5.59 1.34	10.08 4.09	14.02 4.65	17.64 5.38	21.40 9.44	23.25 10.58	24.57	25.03
Sacramento.....	0 0	.01 0	.40 .53	1.44 .54	3.59 .90	7.12 3.12	10.81 3.41	13.95 3.79	16.96 7.39	18.96 8.81	19.94	20.09
San Diego.....	0 0	0 .01	.06 .27	.52 1.31	1.35 1.74	3.17 2.22	5.17 2.65	7.13 5.45	8.83 7.96	9.57 8.45	9.98	10.01
San Francisco.....	.01 .01	.01 .01	.30 .40	1.59 .67	4.06 1.11	8.30 4.32	12.63 4.58	16.33 5.47	19.47 9.06	21.29 10.42	22.10	22.27
San Luis Obispo.....	.01 0	.05 0	.49 .42	1.82 .54	3.52 .68	5.86 5.20	10.50 6.02	14.08 8.29	18.06 13.04	19.54 14.77	20.41	20.51
Sisson.....	.16 0	.45 0	1.35 1.26	3.89 1.39	8.25 1.69	14.38 4.95	22.62 5.35	28.22 6.10	33.62 10.19	35.98 14.54	38.13	38.80
Summit.....	.24 0	.34 0	.78 .10	2.95 1.10	6.95 2.90	14.24 9.40	24.00 11.40	31.83 15.40	40.19 26.50	44.41 32.70	46.45	47.03
Squirrel Inn.....	.07 0	.21 .20	.65 4.25	1.87 4.38	5.14 7.34	10.75 11.05	18.94 11.41	24.25 19.94	33.27 32.50	35.43 34.86	37.06	37.32
Yosemite.....	.20 0	.48 0	1.92 1.22	3.49 1.91	6.32 2.51	12.10 7.76	20.25 9.39	25.30 12.21	33.18 18.90	35.31 23.42	36.62	37.43
State*.....	.04 .01	.12 .04	.61 1.02	2.06 1.65	4.87 2.55	8.90 6.42	14.31 7.27	18.72 10.07	23.46 15.88	25.25 18.39	26.47	26.78

\*Average of 300 stations.



the close of the preceding month, an extraordinary condition. As an example of the unusual weather of the month, attention is invited to the fact that the greatest snowfall reported in the state was but 24 inches, at Tamarack, Alpine county, altitude 8,000 feet. The normal January snowfall at that place is 187 inches. Nowhere was there appreciable run-off from melting snow, and most streams maintained the lowest stages ever recorded during January, the month which usually marks the middle of the rainy season. Some streams maintained lower stages than those of midsummer. Because of the prolonged drought, ranges deteriorated, stock had to be fed, and some cattle were shipped to neighboring states for pasturage. Numerous orchards had to be irrigated in order to save the trees, an almost unprecedented condition for January.

Deficient precipitation was received during February also. It was the driest February in seven years. While more rain fell than during the preceding month, the average precipitation for the state was but 63 per cent of the normal. At the close of the month the accumulated seasonal precipitation was but 35 to 45 per cent of the normal in the northern and central portions of the state, and 70 to 80 per cent of the normal in southern California. The snowfall in the mountains was markedly deficient, and the amount of snow on the ground at the close of February was only about one-third of that usually to be found at that time of the year. Streams maintained extremely low stages, and in some places the ground water receded below levels reached by suction pumps. In northern California the stages of most streams were the lowest of record for February, and springs which had never been known to cease flowing were rapidly drying up. In some places farmers had to haul water for domestic purposes. In the agricultural portions of the Sacramento and San Joaquin valleys the ground was moistened only to plow depths, and the subsoil remained dry. In southern California conditions were not so critical, as heavy rains fell during the latter part of February and continued into March. At the close of February the accumulated seasonal precipitation was heavier in southern California than elsewhere in the state, a condition just the reverse of that which usually obtains.

During March, generous rains fell in the agricultural portions of the state, and the snowfall in the mountains was abundant. However, the accumulated deficiency during the early portion of the season had become so great that the abundant precipitation of March was insufficient to bring the seasonal precipitation up to the normal anywhere in the state. In the San Joaquin Valley more rain fell during March than during the whole of the preceding eight months of the present season. On April 1 the accumulated seasonal precipitation was less than 50 per cent of the normal in central and northern California.

Comparative statistics are given in Table II and are shown graphically in the accompanying figures. The diagrams illustrate clearly the markedly deficient precipitation of the present season as compared with the normal.

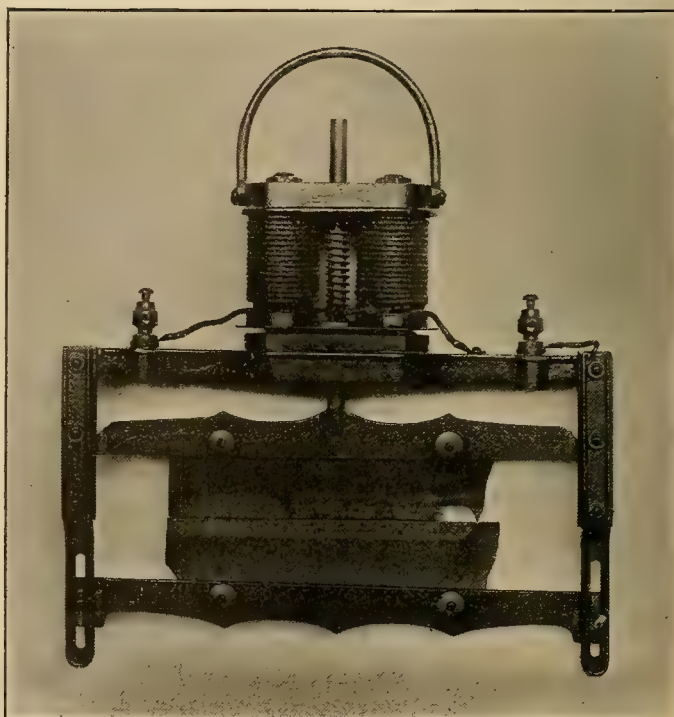
## THE FIRST ARC LAMP IN SAN FRANCISCO

BY FRANK E. SMITH

(The following interesting account of very early days in California's electrical history is by the Western representative of the Weston Electrical Instrument Company. The lamp referred to is still in the writer's possession.—The Editor.)

The Wallace-Farmer arc lamp which is shown in the photograph was the first arc lamp to be tried out in the city of San Francisco in the year 1878. At that time the late Mr. George H. Roe who was to become president of the first central station lighting system in the world was in the brokerage business and had taken some electrical apparatus as security on a note. When the note fell due the owner was unable to meet his obligation and it was discovered that the endorsers were irresponsible and therefore Roe and Plummer (the man with whom Roe was in business) were forced to take the apparatus. Shortly after this the firm of Roe and Plummer dissolved partnership and in the settlement of the partnership affair the electric machinery fell to Mr. Roe as a part of his share in the firm. He immediately employed a man to make experiments with the machine and lamp and had it moved to a planing-mill near the corner of Spear and Market Streets. After connecting the dynamo to the lamp by the necessary wires and connecting the dynamo to the line shaft of the mill by a belt, the apparatus was found to be in working condition, but the light given by the lamp was not very satisfactory.

Mr. Roe became very enthusiastic and after considerable expense had a fairly good electric arc lamp manufactured locally to be used with the Wallace-Farmer dynamo. The new lamp was very much more effective than the Wallace-Farmer lamp and Mr. Roe became convinced that the electric light business was one with money in it, and on June 30,



The Wallace-Farmer arc lamp which was tried out in San Francisco in the year 1878



1897, he associated with himself, Mr. John Bensley, Mr. O. F. Willey, Mr. James R. Hardenburg, and Mr. R. A. Robinson and incorporated the California Electric Light Company which he had organized and which proved to be the first incorporated electric light company for central station lighting in the world.

The writer was employed by the California Electric Light Company as electrical engineer in 1886 and one of his first acts was to rid the station of all the superfluous and antiquated material. In the discard this lamp was found.

The history of the lamp alone is not particularly interesting except that it was among the first to be manufactured for strictly commercial purposes, and while being anything but a commercial success, this particular lamp did play the leading role in what has proven to be one of the greatest industries in the world, namely, central station electric lighting, which in itself was the beginning of the electrical industry. The old California Electric Light Company was later succeeded by the Edison Light and Power Company, which was superseded by the San Francisco Gas & Electric Company, which became a part of the Pacific Gas & Electric Company.

## The Value of Color in Window Displays

BY BERNADINE MEADOWS ANGUS

(Our Chinese neighbors can give us many hints in the art of using color, and the contractor-dealer will do well to study the use of color in some Chinese window displays. It is the woman who buys electrical appliances, and the important part played by color in attracting the woman shopper is taken up in the following article. The author was formerly instructor in the Los Angeles School of Design.—The Editor.)

In the San Francisco Chinatown \$30,000,000 worth of business is done a year. The greatest per cent of sales is made from window displays. The Chinese stores do not advertise in the newspapers and if you have ever been in one, you know that Chinamen are not salesmen.

Whether the Chinese merchant is selling tea or priceless jades he knows that a gorgeous window display will attract people into his shop.

A tea merchant who sells more tea than any other merchant in Chinatown has a window display that would be a fitting background for precious gems. He has arranged bits of gold and silk woven brocades on a plain background, and grouped the little cans of tea covered with bright Chinese silks in an interesting manner. Hardly a woman passes this window who does not stop and his sales of this commonplace article are tremendous.

Color attracts a woman to a window when nothing else will. Not a jumble of all colors mixed up together, but a harmony of well selected colors, with one dominant note.

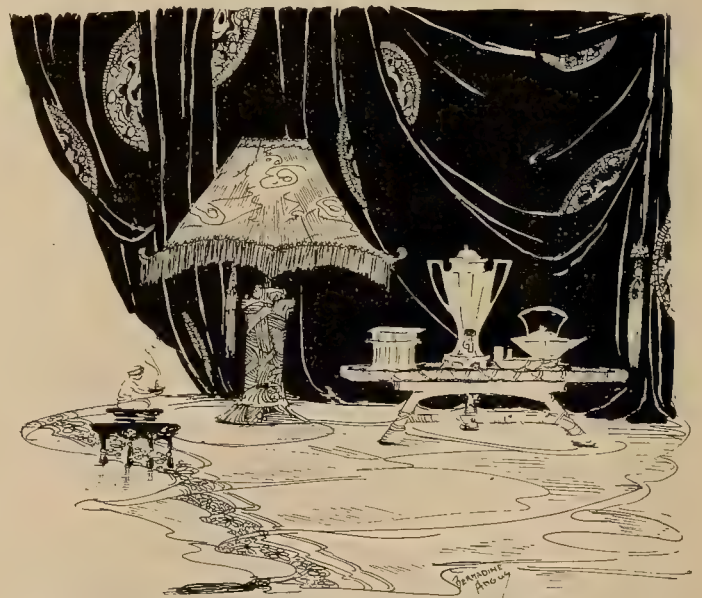
A large jewelry store in Los Angeles has such unique window displays that there is always a crowd around them. Color is the dominating feature. The window is not deep, and this gives the spectator a closer view of the articles displayed.

The back of the window is cased up in small panels; these are changed to conform to the display. In a Spring effect, the general color scheme was rose, in the panels at the back exquisite little paintings of Spring subjects were inserted. These were made by a clever commercial artist, who made them especially for the display on inexpensive material, but getting an artistic effect.

A pool effect was obtained in the center of the window by a large flat mirror, the edges lost in folds of emerald silk. A crystal bowl held drooping ferns and spring flowers. Butterflies tipped sprays of each blossoms. Diamonds and emeralds were the only jewels displayed.

Their Oriental window held innumerable crowds

for a week. It was a miniature interior of a temple. A buddha placed high on an altar had many little steps leading up to it. Incense burned in tiny containers, and dozens of little figures, robed in gor-



Display your electric appliances as a jeweler displays silver, not as a hardware man displays hammers and nails. By an artistic use of color and design the most exquisite effects may be obtained in electrical window displays.

geous silks carrying trays of dazzling unset gems were grouped on the steps going up to the buddha and coming with their gifts through the temple arches. The general tone of the setting was dark and somber, depicting the atmosphere of the temple; this gave the gorgeous robes of the figures and the sparkling gems greater contrast. These are but two of their many unusual displays, that cause more comment than any other display of the kind in the city.

No matter what had been displayed in these windows, whether tooth paste, or hardware, people would have stopped and looked and become interested in that particular store.



It isn't the thing you display, it is the way you do it. Meat is probably the ugliest display ever put in a window. Great hunks of bloody beef, hanging on a hook are anything but appealing, but there is a butcher's window on Market street in San Francisco that brings that market hundreds of dollars in trade. A freezing plant is installed in the window and the meat is arranged on white enameled platters. Each piece is surrounded with green lettuce and parsley. The general color effect is white and green—a very clean looking combination. The fat on the meat is cut in curly-cues, and the tips are covered with fancy paper. The window is so clean and fresh that it inspires the woman shopper to go out of her way to trade at that market. The window sells the goods.

Electric appliances are seldom displayed to their best advantage. Most electrical goods are displayed like hardware. There are more possibilities in displaying these goods than many other articles that are attracting attention and bringing business to the merchants.

The woman shopper must be attracted. She is the one who selects these things for her home. To compel a woman to stop and examine a window display, something must appeal forcefully.

A window display that many women would stop to look at would be a dining tea table set for afternoon tea. A rug should be placed in the floor of the window; plain folds of material or an attractive screen to form the background; a wicker tea-table and a couple of chairs. The tea-table should have an attractive lace cover and a bowl of bright colored flowers in the center and be perfectly equipped with an electric tea service, a coffee percolator and toaster. Don't put everything in the shop on the table—you will lose the exclusive effect of the tea and coffee service. The afternoon tea hour is one of the most popular serving times of the day and women take great pleasure in having a perfectly equipped tea-table.

An electrical breakfast table would have great interest for the housewife. A woman likes to see

things as they look in use. That is why gowns are displayed on figures instead of in boxes. A desire for a thing is created by seeing it as it looks to others.

The greatest mistake the dealer makes is crowding a window full of every kind of thing he has in the store. In the first place this confuses the mind of the observer, and second and most important, it takes away the exclusive quality of the goods. In any other line of business a crowded, over-stocked window is the sign of a cheap place—the five and ten cent stores are an example.

An exclusive millinery store puts one or two hats in a window, displayed against an artistic background. They do not pile all the hats in stock in the window to show they have them. A patron knows they have more than those shown in the window and goes in to see them.

An interesting and attractive color arrangement for a window displaying lamps, percolators, toasters, etc., would be a background of bright electric blue. The floor of the window covered with a neutral color—gray or putty; several exclusive electric appliances placed on silver trays, that reflect the polished surfaces of the articles and accentuate their grace and beauty. Flowers of yellow or gold color in a crystal bowl add an accent to the arrangement. These articles can be made to appear so elegant, by their arrangement and surroundings, that the price will seem small to the purchaser. As they are usually displayed, \$20.00 and \$25.00 seems high for a "coffee pot."

Display your electric appliances as a jeweler displays silver, not as a hardware man displays hammers and nails.

When showing table lamps, have a library table with a rich cover and show lamps one at a time on this, so the patron can see how it will look on her own table. Floor lamps should be shown on a rug instead of the regular floor of the store. The atmosphere around a thing is what makes it appealing or commonplace.

## Enthusiasing a Sales Force

(In the many plans evolved for creating working enthusiasm, those based on the principle of competition have usually been the most successful. The following simple and elastic system is described in one of the interesting pamphlets recently issued by the Hammermill Paper Company of Erie, Pa.—The Editor.)

How shall the executive tap the spring of enthusiasm so as to get the best results from his men?

One answer is: make their work a game and teach them to play it for the sake of the contest. But make the contest a fair one so that jealousies and mean rivalry will be avoided and the best in a man be brought out.

### Making It a Game —

Larger business houses of America acting on this principle have gone to great lengths to foster the game spirit among their men—especially among salesmen. They set a goal which any man who tries may reach, a goal not too easy for the strong man and not too hard for the weak man. Then they

arouse the competitive spirit, taking great care to even the chances so that every man will have a chance to develop his ability and to partake of the sport. Finally, they offer honors and rewards to the leaders as visible evidence that the game is not one-sided and that the house is willing to divide with them the profits from increased business.

### Practical for Any Concern —

Valuable as the method is of stimulating salesmen, both wholesale and retail, to renewed effort, the plan has been reluctantly neglected by many smaller concerns because of the difficulty of keeping it up. It is hard to arrive at a fair basis; the cost of keeping up the system has been thought to be excessive; the



SALESMEN'S REPORT							SALESMEN'S STANDING	
DEPARTMENT _____							WEEK OF <u>August 5<sup>th</sup></u>	
<u>August 1918</u>								
	NAME	SALES	SALARY	%	STANDING	NAME	STANDING	
	L. M. Clark	641.-	125.00	19.50	7	T. S. Williams	1	
	C. C. Wilson	891.-	100.00	11.20	2	C. C. Wilson	2	
	R. T. Brown	420.-	75.00	17.86	6	F. L. Wolf	3	
	W. N. Adams	679.-	90.00	13.25	4	W. N. Adams	4	
	A. T. Madison	341.-	100.00	29.33	8	R. N. Finley	5	
	F. L. Wolf	1180.-	150.00	12.71	3	R. T. Brown	6	
	R. N. Finley	590.-	100.00	16.95	5	L. M. Clark	7	
	T. S. Williams	973.-	85.00	8.74	1	A. T. Madison	8	

This form, used to arouse the competitive spirit in a sales force, may be posted in some conspicuous place or mailed to the men in the field. It is made up every week and gives each man's standing, based on his salary divided by his sales for the week. The system can be adapted to almost any kind of business.

shortage of labor has been a contributing factor; and it is difficult to find a way to put the affair on a business footing. Such objections are not unreasonable.

An Indianapolis concern has, however, worked out a simple system which is at once a guide to the manager in discovering the worth of his men and a spur to greater effort to the men who are representing the house in the city and on the road. The plan used is simple, easy to keep up, and for smaller concerns quite as effective as the charts, graphs and similar elaborate records used by some houses. This method is an adaptation of the percentage system and lends itself to an infinite variety of interesting contests.

#### Salesmen's Rating —

The form used to record results is shown here. It is divided into two parts, one for the sales manager and the other for the men, the perforated line marking the division. The standing of the salesmen whose names were written on the form was determined by this simple process:

The names of all the men to be graded were written in the Name column of the Salesmen's Report section. Next the amount of their sales for the month was entered in the Sales column and the amount of salary earned posted from the pay roll in the Salary column. As the third step, the amount of salary earned by each man was divided by his sales to find his percentage. The figures were entered after each man's name in the Per Cent column. Finally, each man's standing was determined by comparing the various percentages. The salesman who showed the lowest percentage was graded No. 1 and others were ranked accordingly. Then their names were written in the Standing column of the Salesmen's Report section. When this simple task was completed the names and the rank of each salesman were written in the Salesmen's Standing section. This section may be detached and posted where every man may see it or copies may be sent to the men on the road.

This record, of course, was taken on the sales of one line and would not do for salesmen selling a large number of lines at varying rates of profit and expense. The principle of percentages on which the form is based may, however, be adopted without change. If the amount of sales of a certain line or lines is not a fair basis, the percentage of selling expense for the month may be the grounds for the contest. Salesmen may also be graded on the percentage of sales quota filled. The amount of profit made may be a fair way of figuring. Gain over the previous year's business, complaints, canceled orders, bad accounts, new orders, may all be factors on which to base a contest. But no matter what variation ingenuity suggests, the simple little form which has been illustrated will go far in telling the busy manager or proprietor little and big truths about the ability of his men.

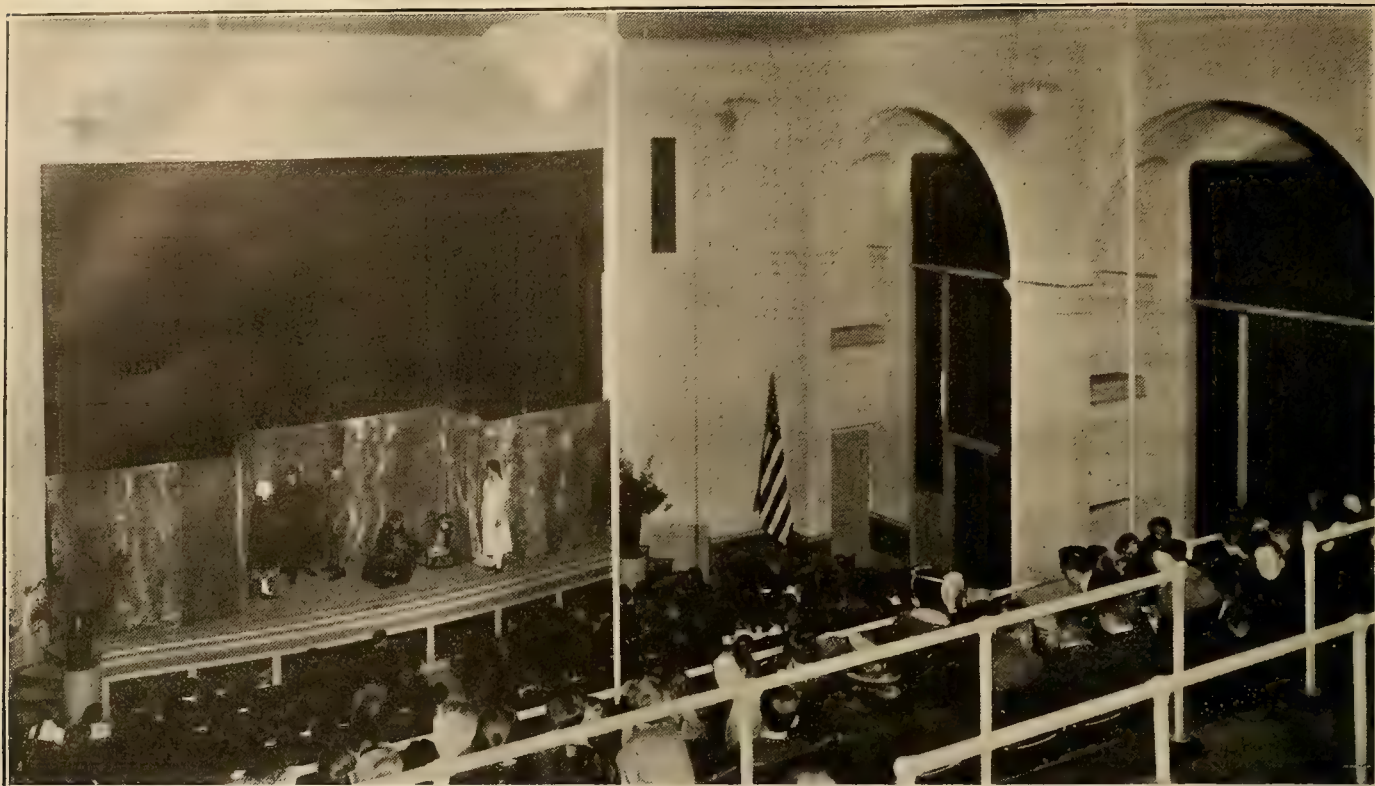
#### Suitable for Retail Stores —

The plan is suitable for retail stores as well as for wholesalers, and if the store is too large a unit, it may be kept by departments. In the shop the basis may be the output of the worker. In short, the record, with but slight modification, may be adapted to almost any line of business.

In all cases the use of the simple and inexpensive system will speed up sales or whip up production as the case may be. When it is used, there need be no guessing on the part of an employe as to how he stands with the firm. Each man will be spurred in his efforts by the certainty that the man next above him will leave no stone unturned to advance or at least to hold his grade.

In this way the executive may bring system into his work and enthusiasm to his men. By his organization working precisely and accurately he can secure the fullest returns from dollars invested in his working force, and he will probably find also that the stimulated personal interest is an intangible asset which is worth while in itself, quite apart from any material return.





A view of the auditorium of the Francis E. Willard grammar school of Berkeley, taken during the production of a series of tableaux which not only served to visualize the story of *Evangeline* for the boys and girls who had been studying that poem, but also awakened their interest in the striking effects which can be brought about through the use of electricity. The spot light machine which furnished the only light used during the production can be seen at the front of the balcony.

## Electricity and the School Entertainment

(The future of the electrical industry depends upon the boy and girl of today, because they are the purchasers of tomorrow. This story of the introduction of electricity into a school entertainment is an example of the many practical ways in which the electrical manufacturer, jobber and contractor-dealer can stimulate the child's interest in electricity so that the electrical idea will be carried into the home of today and will become a part of the public mind of the future. —The Editor.)

The public school presents an ever growing opportunity to men of the electrical industry whether their business be the supplying of power, the installing of lighting and cleaning systems, or the furnishing of magic lanterns and appliances for vocational departments. Furthermore, it is becoming clear that the school is not only a noteworthy consumer of electricity but also a medium through which the electrical idea can be sold to the most obscure home. What happens in the American school is discussed in the American home, and so the electrical dealer can rest assured that every application of electricity in the school house, from the cleaning of rooms to the presentation of entertainments, will be discussed beyond the school house walls.

### Interest in Entertainments

No part of school life interests the girl or boy more than the school entertainment, therefore it is true that here, especially, will the application of electricity awaken their interest.

The simple and inexpensive way in which electricity can be used in making the grammar school entertainment effective was demonstrated a short time ago in the auditorium of the Francis E. Willard school of Berkeley, California.

The seventh and eighth grades had been studying Longfellow's poem, "*Evangeline*." In order to make the more important scenes vital to the children, the teacher asked one of the eighth grade girls to give a reading of the poem at one of the Friday



Scenes which were presented during the reading of the first portion of Longfellow's "*Evangeline*." The Arcadian maiden herself, the betrothal scene and a picture of the lovers in the moonlight comprised this happy group. In each case the color of the spot light used brought out the emotional tone of the particular scene.





The picture of the parting of the lovers occasioned by the deportation of the villagers of Grand Pres was followed by two tableaux which told the story of the wanderings of Evangeline along the great Mississippi in search of Gabriel. One shows the awakening of Evangeline as she feels that her lover is passing in a near-by boat, and the other shows her meeting with Gabriel's father on the day after the latter has left for the North.

afternoon entertainments. But the child, believing that "things seen are mightier than things heard," lost no time in planning a series of tableaux to illustrate the lines she had selected to read.

### The Need of Electricity

Then there arose the problem of making these pictures effective enough to hold the attention of the most unpoetical boy in school. After some pondering, the young eighth grader asked the advice of a friend from the General Electric Company, and between the two a most adequate scheme of production was worked out. A strong incandescent spot light with a colored disk wheel comprised the necessary electrical equipment.

A plain setting to bring out the tableaux was obtained through the use of a simple cheese cloth curtain which had been dipped in blue green dye and wrung out while wet so that a mottled effect was produced.

When the auditorium became totally dark, on the afternoon of the production, a strong white spot light served to focus the attention of the most restless lad upon the center of the stage where the young interpreter read the introduction to the story of Evangeline. Then she took her place at the side of the stage, from where the interpretation of the following tableaux was read. The electrical co-worker had arranged a shaded amber colored mazda lamp behind the cheese cloth curtain so that the child could see to read without the use of a noticeable light which would detract from the tableaux effect.

For a moment the stage was totally dark, then Evangeline appeared in the center of a golden circle of light. And every child heard with new meaning the lines:

"Fair was she to behold, that maiden of seventeen summers.  
Black were her eyes as the berry that grows on the thorn by the wayside,  
Black, yet how softly they gleamed beneath the brown shade of her tresses."

The reading continued while the stage became dark, allowing the first little statue to slip out through the back of the curtain, and then in a moment a rose circle of light fell upon the happy betrothal scene of Evangeline and Gabriel.

### Color Tone Given to Scenes

And so the various pictures were given the proper tone through the use of different colored lights, thus bringing out the child's own interpretation of the lines through the use of color. That color can give the correct atmosphere to any stage scene has for some time been an accepted fact, but an elaborate stage setting has generally been thought necessary to bring out the effect. This simple school-house production, on the other hand, demonstrated the fact that the use of colored light is as effective in producing the atmosphere of a scene as an expensive stage setting.

It was, in reality, a demonstration of Belasco's theory that the art of stage setting is still in its infancy simply because the art of stage lighting is still in its infancy. This master of stage craft predicts that in time all settings will be produced through the use of lights to the exclusion of other scenery and that the effect so produced will be more pleasing than any which have been obtained through the use of today's method of stagecraft. It truly seems that there can be no limit to the field of interior illumination.

The third tableau, which appeared in a circle of soft blue-green light, illustrated the lines which follow the scene of the betrothal:

"Meanwhile apart, in the twilight gloom of a window's embrasure,  
Sat the lovers, and whispered together, beholding the moon rise  
Over the pallid sea and the silvery mist of the meadows."

And then, after the brief period of darkness which served as well as any curtain in allowing the small actors to change places, the fourth picture appeared



In the first scene of this group where Evangeline is asking advice from the magic Indian woman, the effect of a camp fire was obtained by placing a red mazda lamp under some paper and among the camp fire sticks. The parting of Evangeline from Gabriel's father and from her Indian friends as she goes onward in her search is shown in the next tableau, while the final union of the two lovers, which was presented in a soft circle of lavender light, interpreted the last lines of the poem.



in a circle of lavender light. This showed the parting of the two lovers of Arcadia, brought about by the tragic deportation of its French settlers by the English military forces in early Colonial times.

After this, the outstanding points of Evangeline's wanderings in search of her lover were presented in the four scenes following. In the third tableau of this group, which showed Evangeline relating her tale of love to the Shawnee Indian woman, the necessary campfire was effected by a couple of red electric globes burning under some white paper among regulation campfire sticks.

### The American Boy and Electricity

This sort of contrivance seems, of course, very simple to those beyond the walls of the eighth grade, but to the boy under sixteen, the arranging of such an electrical campfire is fascinating. In fact, the young director found that the interest of the small boys was increased one hundred per cent when the electrical idea came into the production. The American boy seems to feel with a strange intuition that he is to live in the great electrical age, for there is hardly a lad today whose interest cannot be captured immediately by any sort of electrical apparatus.

And so in working up this Evangeline entertainment, it could be seen that the small boys found the tableaux worthy of their attention as soon as they realized that a large part of their success was to depend on the use of electricity. If the boy under sixteen becomes a "booster" of electricity, he will not only talk the electrical idea at home but will certainly be a staunch supporter of the electrical idea during the coming forty or fifty years.

The last tableau of the Evangeline entertainment appeared in a circle of lavender light. It pictured the reunion of Evangeline and Gabriel at the death-bed of the latter.

"All was ended now, the hope, and the fear and the sorrow,  
All the aching of heart, the restless, unsatisfied longing,  
All the dull, deep pain, the constant anguish of patience!  
And, as she pressed once more the lifeless head to her bosom,  
Meekly she bowed her own, and murmured, 'Father, I thank Thee!'"

### A Finished Production

Then the interpreter appeared again in the light at the center of the stage and read the conclusion of the poem. When the lights went on, children, teachers and visitors, all recognized that this school-house entertainment had the marks of a finished production. And furthermore, they realized that the finished and complete effect had been made possible through the use of electricity.

### The School Entertainment of the Future

The work of these school children combined with that of the co-workers from the General Electric Company really opened the way for the extensive use of electricity in the production of school entertainments. It showed how the child's imagination can be developed in this way, since it is spurred on through the effective productions which electricity makes possible.

There are numerous ways in which the tableau can be used in impressing particular facts upon the child's mind. For example, the music teacher will find song tableaux valuable in creating interest in

the songs she is teaching, because a picture which is typical of a certain song can be effectively presented as a tableau while the song is being played or sung behind the scenes. For example, appropriate tableaux which have been presented to illustrate "America" will be remembered by the child whenever the tune is played or sung; and so he will always visualize the idea for which the song stands.

### Electricity and the Dancing Production

In a Kermess given recently by the girls of Mills College various other inexpensive yet effective ways in which electricity can be used in improving this sort of an entertainment were shown. In a Fire-fly dance the desired effect was produced through the use of little hand flashlights in the hands of the dancers. These were made to flicker in real fire-fly fashion as the blue figures danced here and there on the dimly lighted stage.

From the foregoing uses which have been made of electricity in certain school productions, the teacher and the electrical man should realize that wherever there is an effect to produce, that effect can be increased one hundred per cent through the application of electricity. Furthermore, the men of the electrical industry who realize the value of increasing the school-house consumption of electricity should see that not only can this consumption be increased through the school entertainment, but also that in this way they can best appeal to the child so as to capitalize that electrical interest which lies latent in the mind of every coming American.

### ELECTRICAL DEVELOPMENT IN CHINA

There are only 168 electrical undertakings in China, 49 of which are under foreign management. The Japanese have invested over \$100,000,000 in such enterprises through the South Manchurian Railway Company, and \$759,000 through other concerns; and the British have invested \$25,000,000, of which about half is through Chinese concerns. In Canton there are 22 power and light companies in addition to the British Tramway Company. No water power is used, most of the power being derived from oil, except for the two coal-burning plants. They are all small, only four having a capacity of over 1,000 kw. There are also 22 electrical enterprises in Kiangsu Province, centered around the city of Shanghai, which develop twice the powers of the Canton plants. All of them use steam power. Of the 15 electrical companies in Shengking Province, Manchuria, 13 are managed and owned by the Japanese, and the 30,000 kilowatts of power generated are supplied to Chinese-Japanese industry or transportation enterprises. The largest single enterprise is the No. 1 Power House of the railway company, which generates 4,500 kw. by steam. Although Shantung Province is one of the most populous areas in China there are but four Chinese and one Japanese plants, generating a total of but 5,000 kw. In the other Provinces there are only the small native plants using gas power and operating on a very small scale.



# Office Records—Their Filing and Indexing

BY IRENE WARREN

(In this eleventh of the series of articles by the Director of the Chicago School of Filing and Indexing, the author summarizes the various problems of supervision and administration which must be solved in putting the filing department upon an efficient working basis. A unique system of preparing a daily statistical report of the department is explained and illustrated.—The Editor.)

## PROBLEMS OF SUPERVISION AND ADMINISTRATION

When we reduce the many filing systems on the market down to their basic principles, we find that they all are planned to classify the various kinds of materials:—

1. By the name of the individual, firm, or item.
2. By the location.
3. By the subject.

So far, we have discovered only four practical methods of arrangement:—

1. By the alphabet (which is used most generally).
2. By numbers—consecutive numbers or decimals.
3. By dates.
4. By a color scheme.

There are very few systems that are pure types of any one of these arrangements; most of them are combinations of two or more of them. Manufacturers frequently have introduced various devices which have little value and are confusing to both operator and user. The best filing systems are the simplest in construction, and are those absolutely free from any devices, lettering or numbers not essential to the operator or user.

### Problems of the File Clerk

But the installation and management of a filing system is not always as simple as this might indicate. The arrangement by location becomes a complicated problem in a telephone company, for instance, when it means a list of streets divided by east and west, north and south, in which buildings are numbered and where the rooms within the large buildings run into the hundreds. It may take great ingenuity for even an expert file clerk to set up the files for the claim department in a transportation company which may control fifty or more lines—possibly a dozen or more of them running into the same city—since these claims may be referred to by agents shipping or receiving, by the order or shipping number, or by the name of consignee or consignor, and information must be given regarding the movement of shipments over the various roads as well.

This means knowing the given business well and understanding thoroughly the three classifications with the four methods for obtaining these arrangements as cited above, and the best equipment, and then adapting these to the definite problem in hand.

The file clerk then considers:

1. How much of the information needed can be concentrated in one record to advantage.
2. How much of this record should be duplicated and either arranged according to another method, or sent to other departments for use.
3. Whether these files may be made to index themselves, or if card indexes are needed to supplement them.

Usually the file clerk is directly responsible to the office manager, and it is extremely important that the latter should have a good appreciation, if not actual knowledge, of the basic principles of filing and indexing and the more important administrative questions involved. Most important among these is the right relation of the filing department to the other departments in the corporation and the enforcement of the regulations that materials for filing shall be sent promptly to the filing department and kept there during such time as they are not in actual use.

When a new record is to be made in any of the departments, the file clerk ought to be consulted to see that the information isn't already in some record in use in another department; and also, that he may advise about the best form for the record. If a department will clearly state the results it wishes to obtain, carefully assemble the necessary data, or indicate what these are, and work the problem out with their own file clerk (provided he is competent and well trained), there will seldom be need for calling in outside experts. Too great stress cannot be laid on the points of choosing the well trained file executive, having the office manager thoroughly in sympathy with the filing department; and at every turn helping place it in right relation with the other departments.

### Equipment and Management

Service is the keynote of the modern filing department and the location of this department within the firm must be such as to ensure economical service to the various departments needing it. Anything but the best equipment is poor economy for this department. A few dollars spent in the best furniture, supplies and devices save much wasted human effort. An elaborate equipment is unnecessary, but constant, careful attention to the selection of time-saving and labor-saving equipment will reduce the waste in the daily routine. This takes the wisest kind of supervision.

Some of the most obviously bad conditions regarding equipment and management which thousands of file clerks are struggling with today, that are keeping executives from getting the papers from the files instantly when needed, and which could be remedied so easily, might be listed as follows:

1. Drawers in cabinets are too full to permit accurate, rapid filing.
2. Poor system of guiding—guides too complicated in plan, not evenly distributed and not enough in a drawer. There should be from twenty-five to forty guides in a drawer.
3. Folders of such poor material that tabs break down.
4. Too many letters in a folder.
5. Name on folder is not written in the form in which it is to be filed.



Specimen of monthly statistical report of filing department.

6. If more than one file is kept, failure to stamp each item with the name of the file where the item belongs.
7. Letters not marked properly for filing.
8. Misspelling of names by stenographers not carefully checked, either before or after letters get to the filing department.
9. Members of different departments pin papers together for temporary use and they get into the files that way.
10. No charging system for papers taken from the files.
11. No adequate follow-up system.
12. Transfer of correspondence not made at stated intervals.
13. No regulations for those using the files.
14. Letters are held in individuals' desks either carelessly or because they are wanted at some future date.

In most firms, it is necessary to give considerable attention to the personnel of the filing department. Stenographers, typists, and general office workers often tell the file clerks that they think filing beneath them; that it is underpaid, monotonous work, with no future to it. The executive file clerk will do well to hold a weekly conference with his staff, and point by point take up the objections to filing. He has also the opportunity to prove that the work of the filing department may be so distributed that it is extremely interesting to the workers and that there is no room in the department for the worker who will not **think**. "Thinking jobs" usually receive their financial reward and give opportunity for the worker's advancement. Executives are seeing that the filing department is the best place for employes to learn the business, and are starting all clerical workers there. With the research or library department as its direct goal and many of the other

The managers of some of the larger motion picture theaters have found the inter-communicating telephone a great efficiency factor in their work. Countless times during the performance the manager has occasion to communicate with the box office, operative both, floor captains, orchestra pit, music room, electrician and doorman. It has been found that a system by which the pressure of a single button gives almost immediate connection with the desired party, saves endless steps, valuable time, and makes top-notch service possible.



## The Man in the Company

BY A. B. WOLLABER

(At this time, when the expansion of the electric utilities of the West is proceeding at such a rapid rate, it is of the greatest importance carefully to study the principles underlying this substantial growth. This article by A. B. Wollaber, district agent of Southern California Edison Company, is the first of two covering this important subject.—The Editor.)

Service has ever been the watchword of the electrical industry and it is one of the corner-stones upon which all utility companies are built. The rendering of service to the public consists not only of the supplying of the product of the company but also largely the conscientious, considerate manner in which the employes of the companies, from the managers down, deal with the public.

Recently the president of the National Electric Light Association adopted as a slogan the words "Service before profit." Let us stop for a moment and consider the meaning of these words not only as applied to the industry, but to the individual worker in the industry. Service, briefly defined, consists in giving an equivalent for an equivalent, while profit may be briefly referred to as gain, benefit or advantage. In considering this subject from the standpoint of the individual worker and not particularly the company, the above slogan is changed to say that the individual worker has a right to adopt for his motto, "Service with profit." Profit not only to his company and to the public whom he serves, but profit to himself. The question to be considered by all of us is what this profit is going to be. Is it to be measured in dollars and cents? Or are we going to take another and broader view of the meaning of these words and learn that our services and those of our company cannot be entirely measured on a dollar and cent basis, but as a service we ought rightfully to give with profit to ourselves and to the community we serve. These conditions are necessary to the successful carrying on of any enterprise, and in the electrical industry the standard is set high.

It was Carlyle who said that "no man can exist apart from his circumstances; these must in any case be the field of his effort and in great measure, must determine the means which he uses, and the end he proposes to reach."

Electrical workers, what are your circumstances? I will answer for you and say they are largely what you make them.

Are you a time server and a clock watcher in the industry, content with eight hours of work, or are you an honest, earnest worker in the ranks, looking for something better, striving to enter in, and to mount the ladder of success, round by round? If the latter—then the industry is possessed of the right kind of a worker and the community you serve is bound to get the right impression of the industry which we are all so proud to represent. If the former, then I say, you are wasting your time and it were better for you that you separate yourself from the industry than to go on "getting by" and creating for yourself and for your company a condition which is a liability to both.

How often you hear it said that So-and-So owes his advancement in any organization to certain pull

that he has with the management and certain individuals there are in all organizations who, blinded by their own shortcomings, cannot conceive how another can advance without some sort of stand-in with those in authority. Those who stand on the side lines in a football game, cheering their favorite team to victory, are not the ones who really win the game. Their encouragement may aid the morale of their particular favorite but their cheers aid little in the final outcome of the battle. Are you in the game fighting to win for your company and for yourself, or are you standing on the side line, shouting not always words of encouragement to your fellow workers but complaining, backbiting and finding fault, with the attending evils that result from such an attitude. It is well to think of these things and to think of them seriously, for the time has come in all lines of business when men are needed more than ever before. Not merely numerical forces, but workers of the right sort; loyal, conscientious and faithful workers, and for this end we serve.

To confine the consideration of this very large subject to a proper length, it has been deemed best to consider it from the angle of those employes who more often meet the public. In most electric utility companies they are, first, the district manager; second, the chief clerk; third, the district foreman; and in the fourth class, for convenience, we may place all other employes.

### To the District Manager

The manager of any business, general or local, is the corner-stone upon which this business is constructed. The district manager may, therefore, properly be considered as the corner-stone upon which rests the whole structure of the district organization. In order that this structure may stand, this corner-stone must be selected carefully. It cannot be "the stone rejected of the builders" but must be symmetrical and true if the organization is to withstand the vicissitudes of time and the battles that are constantly going on round about it.

There is nothing that adds more to the successful administration of any business than confidence, and if a representative of a company has the confidence of its officers and also the confidence and respect of those serving under him he has taken a long stride along the road of successful administration. Are you taking your office force into your confidence and making them feel that they are a part of the organization they represent? Upon returning from meetings with the officials of your company, do you call your force together and give those not fortunate enough to attend, the benefit of what you yourself have learned? If not, you are withholding from those under you a part of the profit they have a right to expect and depriving them of an oppor-



tunity to gain in knowledge through your more fortunate contact with those in authority.

What disposition are you making of the many publications sent you by the company? Do you read them yourself and then pass them along to your force, calling attention to this or that article that would directly improve the condition of your employes? Or are these publications filed away in your office to collect dust and dirt without doing others any good? This is a part of the profit you receive from the company and which will, if carefully considered, fit those under you for positions of trust with the attendant increase in salary such positions warrant.

Are you as quick to commend good work in your employes as you are to censure them for failure to do their duty? One is quite as essential as the other. We are all human beings and a little well-merited praise costs little and goes a long way toward returning a profit on the investment. Are you careful to watch the effect your employes and your office are having on the public? Remember, it is at your counter that this ever present body gains almost its entire impression of your organization. Are you careful to see that this impression is of the right sort? I recall several instances which in my career stand out boldly as examples of what is meant by this question, and will illustrate the point I am endeavoring to drive home. These all occurred in the office of a large utility company doing business in the West.

An official of this company put in a call on the telephone and asked for the local manager. When he received the connection the first question he asked was, "Who answered my call?" He was informed that it was a young lady temporarily employed during the absence of the regular operator. Quick as a flash came the reply from this official, "Make her a permanent employe; we need just such persons in this company." She received her reward and the company had benefited by getting an employe who was capable of giving a good impression to the public.

The next instance was that of a newspaper editor who had constantly fought the company and who was never known to come to the office, notwithstanding he was apparently on friendly terms with the local representative. Later the company built a new office in the community and this editor was induced, among others, to call and inspect it. He did not say a great deal on his first visit, probably because all newspaper editors are supposed to be more or less profound and distant, but it was noticed that he came back again in a few days and this was what he said to the local manager: "I like to come into this office because there is such an atmosphere of good feeling and efficiency; it fairly smiles on you, and when a fellow gets in here he hates to leave."

The final example is a rather sad one but one we meet with almost daily in our dealings with various lines of business. The local manager once met one of his good customers and in the course of conversation was asked this question: "Where did you get that clerk you have in your front office?" He was

informed that he was an old employe of the company and one who was regularly employed in meeting the public. The manager then asked the customer just why he had made the inquiry; he replied, "Well, he always has an expression on his face which seems to say to me, 'I wish you wouldn't come in here and bother me about the payment of your bills.'" Of course, this employe did not wish to create such an impression, but the consumer got that feeling from his attitude which proved without doubt that he was holding a position for which he was not fitted and thereby creating an unfavorable impression for his company. How many good pieces of business have been lost by a thoughtless word or a wrong impression, and many times municipal ownership agitation started by carelessness in representing the company to its consumers! At no time in our history have conditions been more unsettled than at present. This being the case it behooves all to watch, look and listen in order that they may not be found wanting when the test of their ability comes.

### ELECTRICAL CONTRACTOR-DEALER

BY J. H. SROUFE

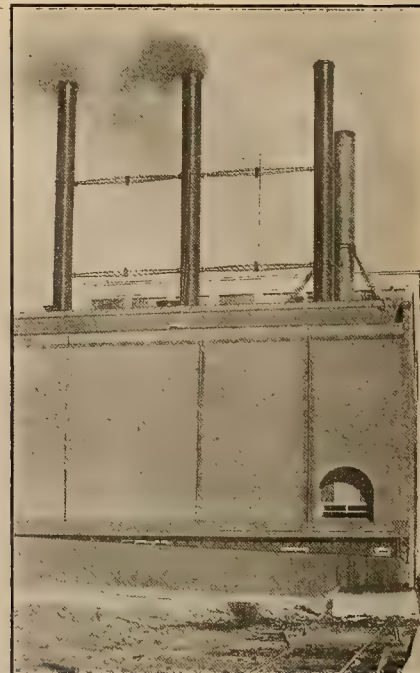
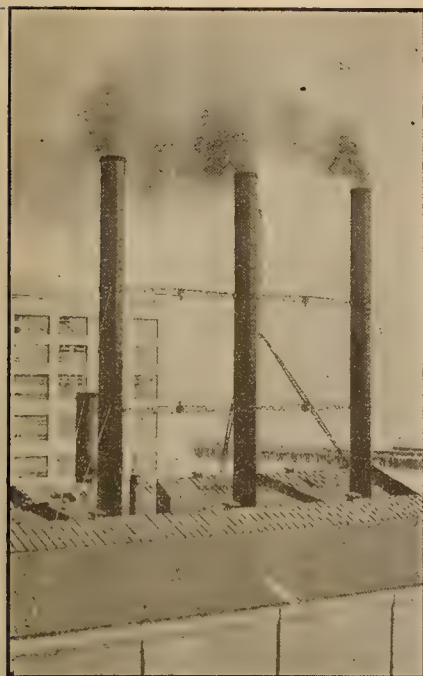
There are three cardinal features that a first-class electrical contractor-dealer must possess in order that he may conduct his business along legitimate lines and make a profit. First, he must be a salesman of no mean abilities. Second, he must possess executive ability. Third, he must be able to make quick, definite and correct decisions.

Today, as we emerge from the price cutting fights of the past, we find that a good salesman is the man who gets the business. He understands what he is selling and knows its worth. It is he who can combine all the features of the job into one and show the customer just what he is buying, be it a socket device or a contract that runs into thousands of dollars. He is a speaker, and talks on a subject that he knows all about in a quick and decisive manner. He can convince the customer that he needs and wants to buy the article up for sale, and he is able to take away from the customer's mind any idea that he is not getting the very thing he wants. A good salesman will not sell a man anything he knows the customer does not want.

An electrical contractor-dealer may be ever so good as a salesman, yet if he does not possess that absolute necessity, called executive ability, his business is sure to go to ruin. Executive ability means the surrounding one's self with the very best of organized plans for executing jobs as they are landed. The good electrical contractor-dealer executive will have a method of executing his work whereby he knows that his job is not running over the estimated cost.

Decision is an essential characteristic of any successful business man. Many a good business has been ruined because of the lack of quick decision. The contractor-dealer should be trained to decide correctly on every question, and when once he exemplifies his ability to decide aright on important problems, his business will progress.





Stacks of Sta. A. Pacific Gas & Electric Co., San Francisco. This plant is one of the largest fuel oil operated power plants in the world. The first view shows improper combustion; the second proper combustion; the third, instances of proper and improper combustion in varying degrees.

## Fuel Oil Burning Appliances

BY ROBERT SIBLEY AND C. H. DELANY

(How to get the greatest energy producing value out of the steam electric plant, oil fired, is a problem of vital interest in these days of decreasing production in fuel oil and increasing cost of the product. A clear understanding of fuel oil burning appliances used in the power plant house is a great aid in solving this problem. Here is an article that treats of storage tanks, measurement of oil, and oil pumps, by the authors of the well-known book on "Fuel Oil and Steam Engineering." This data should prove of great timely helpfulness throughout the West and in countries bordering the Pacific, wherever oil is used as fuel.—The Editor.)

In its course from the point of delivery at the plant to the burners the oil must pass through a number of appliances, which are necessary for the complete equipment of any oil burning plant. In this discussion we shall follow the oil in its journey through the plant and describe briefly the various appliances required for handling it.

Oil may be delivered at the plant either by rail in tank cars or by water in barges or tank steamers specially constructed for the purpose. From these it is pumped into large storage tanks, which may be of either concrete or steel.

**Storage Tanks.**—For power plants large cylindrical steel storage tanks are used. These are usually set on the ground outside the plant and are built in any desired size up to 50,000 barrels capacity. They are built up of riveted steel plates, the thickness of plate and strength of riveted joint being proportioned in accordance with the usual safety rules based on the internal pressure due to the head of oil inside the tank. Thus if the tank is 30 feet high the internal pressure will be that due to 30 feet head of oil or approximately 15 lbs. per square inch. It is customary to surround the storage tank by a concrete wall about 6 feet high far enough away from the tank so that the entire contents of the tank will be held in by the wall in case of a leak in the tank. This is to prevent the oil from leaking out to the surrounding country.

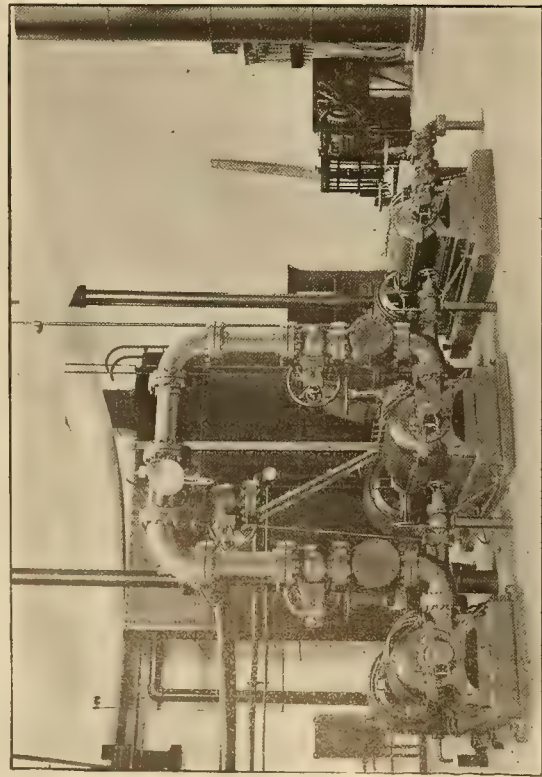
The size of storage tank required depends on two factors:

1. Quantity of oil to be burned.
2. Availability of oil supply.

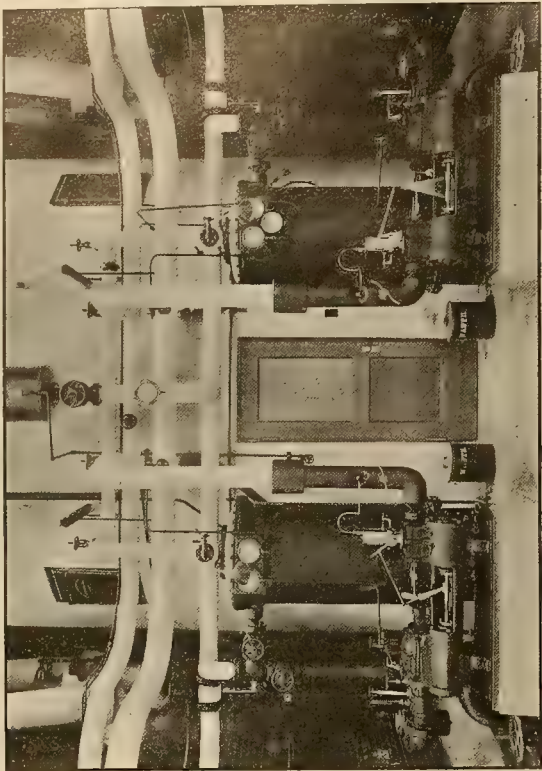
This second factor depends on the location of plant, the method of delivery, and the probability of interruptions in delivery, all of which matters must be carefully considered in determining the number of days' oil supply that should be carried at the plant. Most power plants are provided with tanks of sufficient size to enable them to keep from ten to thirty days' supply of oil on hand. This storage capacity should preferably be divided among two or more tanks rather than all concentrated in a single tank, as this will enable one tank to be emptied for cleaning and repairs without shutting down the entire plant.

In built up districts within the fire limits of cities it is not permissible to locate the storage tanks above ground. The National Board of Fire Underwriters have adopted certain rules for the location of oil storage tanks. Similar rules have been adopted by several cities. In general these rules provide that within the fire limits of cities the tank must be located so that its top is at least 3 feet below the level of the fire room floor and below the lowest pipe in the building to be supplied. The tank must be set on a firm foundation and covered with soft earth or

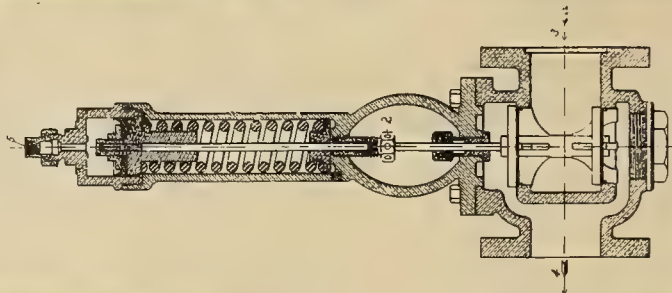




Auxiliary apparatus, turbo driven, at the Long Beach Plant of the Southern California Edison Company



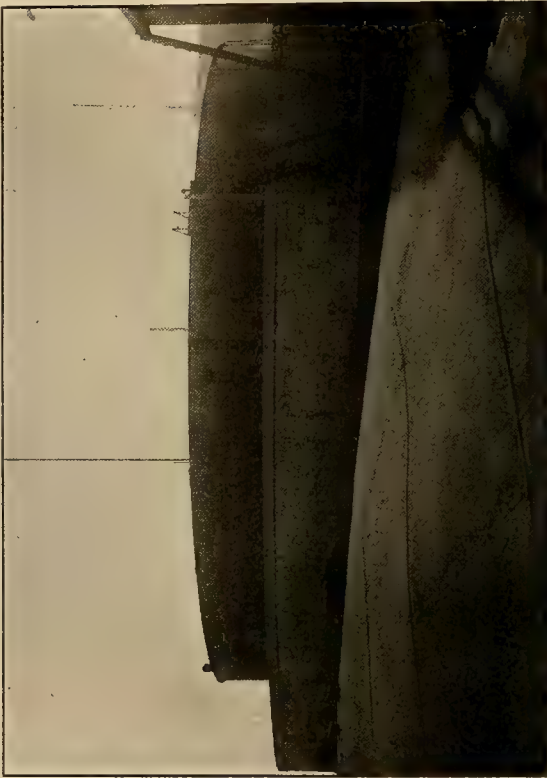
Fuel oil pumps for turbine No. 3 at the Long Beach Plant of the Southern California Edison Company. Note the neat and attractive appearance throughout in this interesting installation, quite typical where oil is used as fuel.



The Witt Pump Governor. It controls the running of a pump and will hold a steady pressure on the discharge line.



The cars are shown on the unloading track of the Redondo Steam Plant of the Southern California Edison Company, and the oil is emptied from them into the flume which runs beside the tank; thence it goes into a small underground tank from which it is pumped into the main storage tank.

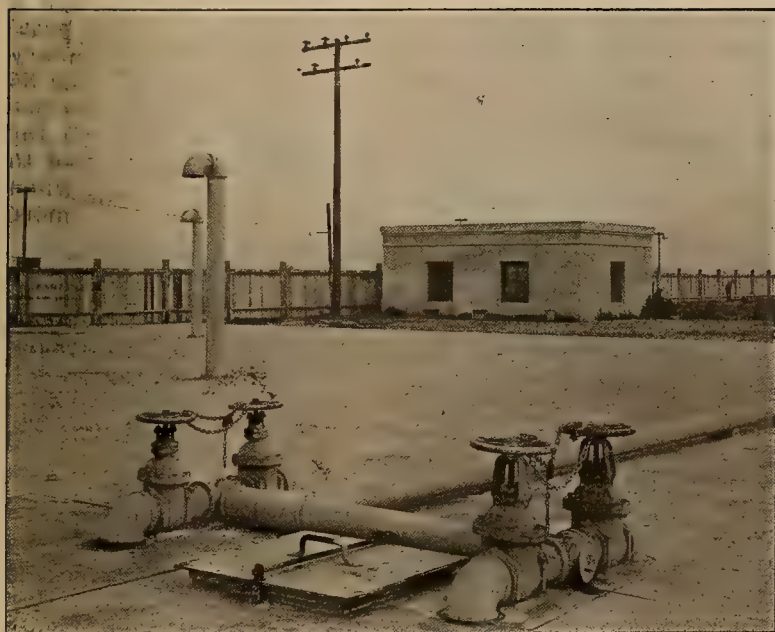


Main oil storage tank at Station C, Pacific Gas & Electric Company, Oakland, California. Tank in foreground is set low for fire protection purposes while tank in rear is surrounded by concrete retaining wall.





Exterior view, Long Beach Plant, Southern California Edison Company. This plant is noted for its use of meters, for various sorts of economy studies and for records obtained in daily operating practice. Note the finish and aesthetic beauty of the exterior.



A close-up view of the filling pipes for the oil storage reservoirs of the Southern California Edison Company's Long Beach Plant. These valves are under control of the oil company from whom the oil is purchased.

sand, no air space being allowed immediately outside the tank.

Every oil storage tank must be provided with the following attachments: Filling pipe, suction pipe, vent pipe, smothering pipe, overflow pipe, and measuring rod or chain.

For tanks less than 1000 gallons capacity the filling pipe and vent pipe may be on the same connection. For larger tanks separate connections are required. The vent pipe must extend from the top of the tank to a point outside the building at least 12 feet above the top of the highest tank car from which the storage tank may be filled. All outlets on the tank should be located on top, the suction pipe running down inside the tank to near the bottom. The smothering pipe consists of a small steam pipe through which steam can be blown in case of fire, thus keeping air away and effectually smothering the flames. The overflow pipe is arranged to carry back to the storage tank all oil not used. An automatic relief valve is provided on the oil pump discharge set to open at a predetermined pressure, and discharging through the overflow pipe back to the storage tank. All pipes should be run as direct as possible and pitched toward the storage tank. The oil in the tank may be measured by means of a rod or chain let down through the top of the tank. The use of gauge glasses should be avoided as they are liable to break, causing leakage of oil.

Many power plants are provided with a service tank located under the fireroom floor in addition to the main storage tank outside the building. The service tank is filled at intervals from the storage tank, and the oil pumps take their supply from the service tank and distribute it to the oil burners.

**Measurement of Oil.**—Oil is ordinarily measured by passing a rod or chain down through the top of the storage tank, the rod being marked off in feet, inches and fractions of an inch. By sounding to the bottom of the tank, the depth of oil can be determined very accurately. A more convenient method, though not quite so accurate, is to use a float with a chain passing over a pulley at the top of the tank, the outer end having a pointer which indicates the height of oil in the tank on a suitably calibrated scale. The height of oil in the tank may also be determined by an indicating or recording pressure gauge, which depends for its operation on the hydrostatic pressure produced by the oil.

After determining the height of oil in the tank it is necessary to convert the measurement into gallons or barrels of oil. To do this it is necessary to carefully calibrate the tank either by pumping into its known quantities of oil, or by taking careful measurements and calculating its contents. This latter method is very simple if the tank has



vertical sides. If, however a cylindrical tank lying horizontally is used, the calculation is somewhat complicated. The attached table giving the capacity of horizontal cylindrical tanks per foot of length for various depths of liquid will be of assistance in this connection.

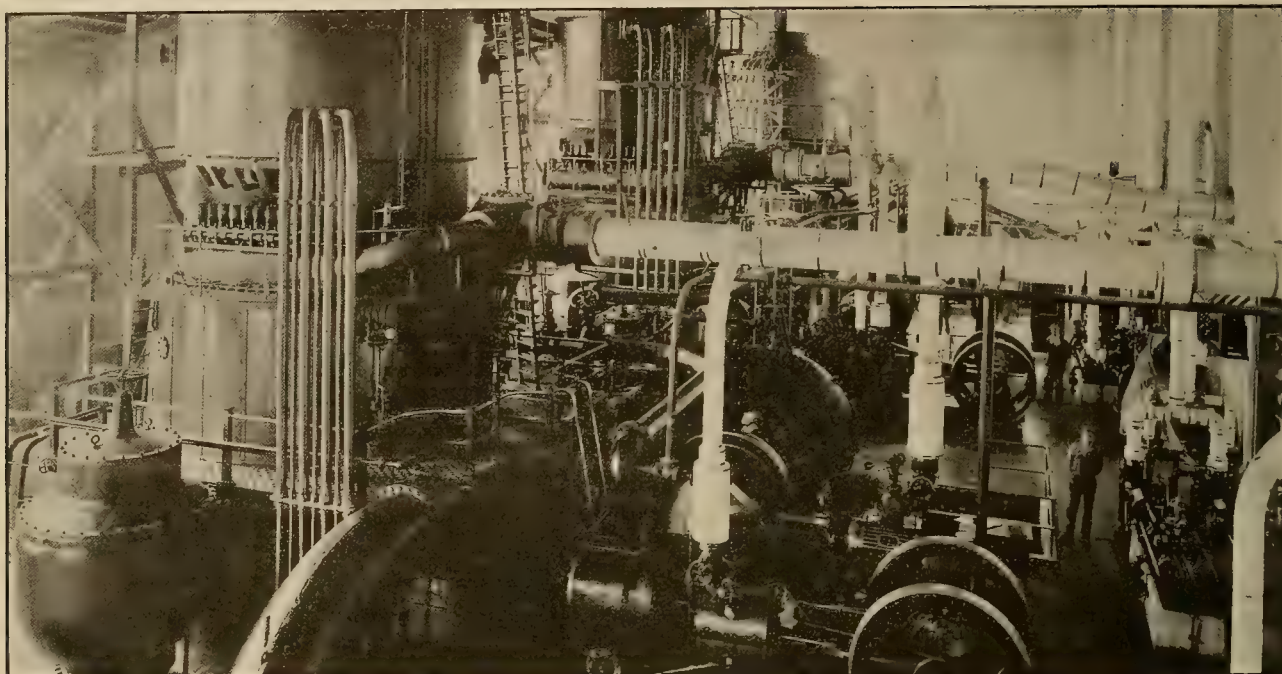
After determining the volume of oil in a tank it is necessary to make correction for its temperature, for, like everything else, oil expands and contracts with changes of temperature and the volume measured at one temperature will not be the same as the volume of the same weight of oil at another

$$V_{60} = \frac{960}{1 + (20 \times .0004)} = 952 \text{ barrels.}$$

If instead of 80° F. the temperature of the oil had been 50° F., the true volume at 60° F. would be

$$V_{60} = \frac{960}{1 + (-10 \times .0004)} = 964 \text{ barrels}$$

**Oil Pumps.**—The oil is taken from the supply tank by the oil pump. The type of pump ordinarily used for this purpose is the ordinary duplex steam driven reciprocating pump. The pump must have



Interior view of Generating Room, Long Beach Plant of Southern California Edison Company. This is one of the largest fuel oil steam generating power plants in the world.

temperature. The amount of variation of the volume of the oil depends on its coefficient of expansion. The coefficient of expansion varies for different oils, but the average value for California oils is usually taken at 0.0004 for each degree Fahrenheit change in temperature; that is, the oil expands four ten-thousandths of its volume for each degree F. rise in temperature. This is equivalent to 0.00072 per degree Centigrade.

In practice 60° F. has been adopted as the standard temperature and to reduce the measured volume to the true volume at 60° F. the following formula is used:

$$V_{60} = \frac{V_t}{1 + (t - 60) \times .0004}$$

where  $V$  = the volume of oil at 60° F.

$V_t$  = the volume of oil as measured, both expressed in barrels, gallons or cubic feet as the case may be.

$t$  = temperature of the oil when measured, in degrees F.

Thus if the soundings in a tank before and after filling show that 960 barrels have been added, and the observed temperature of the oil was 80° F., then the volume at 60° F.

brass valves, and packing that will not be affected by the oil. The pump should be provided with a large air chamber to prevent pulsation of oil pressure due to the strokes of the pump. It is customary to install the pumps in duplicate so that one may be kept shut down at all times ready to go into service immediately if the other has to be shut down for repairs. The pumps should be of sufficient size to deliver the maximum quantity of oil required when operating at comparatively slow speed—not more

Diag. Tank	6"	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"
1'-0"	1.46																			
1'-6"	2.94	5.88																		
2'-0"	4.60	11.75	19.85	23.50																
2'-6"	5.22	13.71	23.07	31.49	36.73															
3'-0"	5.81	15.41	26.40	37.97	47.05	52.88														
3'-6"	6.30	16.95	29.47	42.46	55.01	65.86	71.96													
4'-0"	6.78	18.37	32.16	46.97	61.86	75.67	87.22	94.07												
4'-6"	7.21	19.67	34.63	51.01	67.92	84.30	99.16	111.8	118.5											
5'-0"	7.63	20.90	37.03	54.85	73.38	92.08	109.5	125.9	139.1	146.9										
5'-6"	8.00	22.07	39.23	58.34	78.54	99.12	119.4	138.5	155.6	169.7	177.7									
6'-0"	8.38	23.19	41.36	61.64	83.38	105.8	128.1	149.8	170.1	188.3	203.1	211.5								
6'-6"	8.75	24.16	43.31	64.85	87.96	111.9	136.5	160.3	183.3	204.9	223.6	239.4	248.5							
7'-0"	9.13	25.21	45.62	67.89	92.25	117.8	143.6	169.8	195.9	219.5	242.6	262.5	279.0	287.9						
7'-6"	9.42	26.11	47.05	70.69	96.69	123.4	151.2	179.1	207.2	234.1	259.5	283.5	306.4	319.9	330.6					
8'-0"	9.80	27.04	48.77	73.45	100.2	129.8	158.1	187.7	217.6	244.2	275.3	307.2	326.9	348.6	366.1	376.2				
8'-6"	10.0	27.94	50.47	76.10	104.1	133.9	164.7	195.9	228.1	259.6	290.6	320.1	348.5	374.0	396.4	414.6	424.5			
9'-0"	10.4	28.84	52.04	78.61	107.8	138.4	171.1	204.3	237.9	271.5	304.7	336.6	368.1	397.2	423.4	446.6	465.5	475.9		
9'-6"	10.7	29.70	53.67	81.22	110.9	143.5	177.3	211.5	247.4	282.9	318.2	352.9	386.4	413.8	440.9	465.5	490.2	510.2		
10'-0"	10.9	30.57	54.63	83.62	114.8	148.3	183.2	219.3	256.4	293.7	331.1	368.0	404.2	433.9	462.7	502.7	532.2	556.9	587.5	

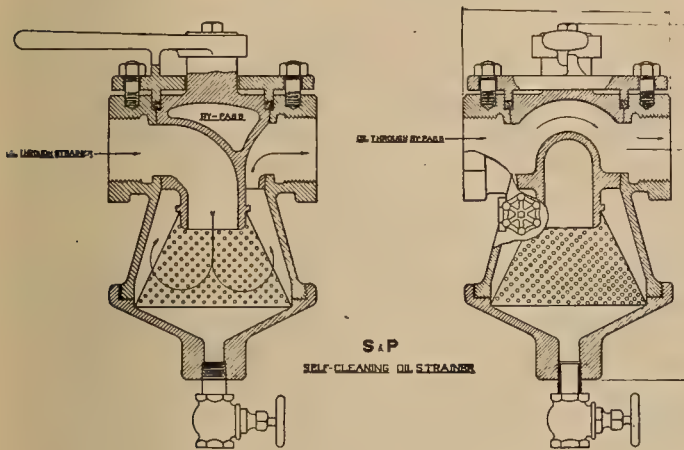
A simple table of capacity of horizontal cylindrical tanks per foot in length



than 15-20 strokes per minute. The pump must not be set too high above the oil tank, for oil cannot be raised by suction as high as water. The maximum suction lift permissible is about 16 feet.

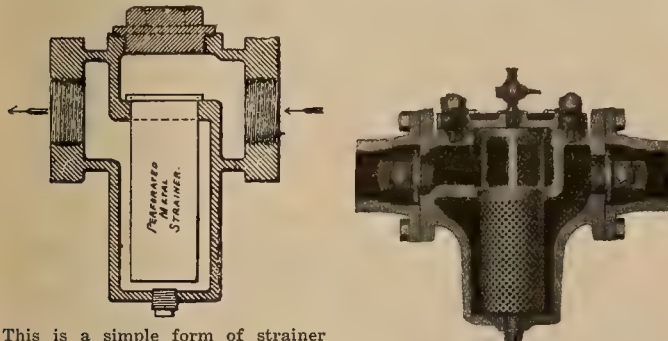
The oil pumps should be provided with a pump governor for the purpose of maintaining a steady oil pressure. An example of this is the Witt pump governor shown in the illustration. It consists of a double ported throttle valve placed on the steam line supplying the pump. The valve stem is attached to a spring loaded piston which is actuated by the oil pressure. If the oil pressure increases the valve partially closes, thus slowing down the pump. If the oil pressure drops the valve opens wider and the pump is speeded up. And predetermined pressure may thus be maintained by adjusting the spring.

**Strainers.**—Every oil burning plant must be provided with some form of strainer to remove the dirt and foreign matter which would be liable to



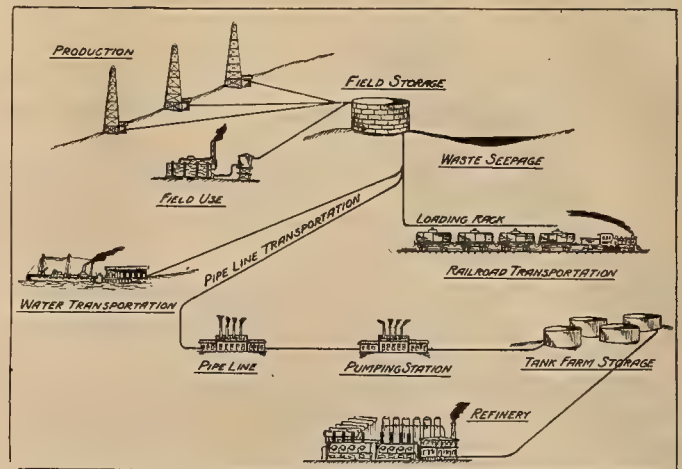
Staples and Pfeiffer Self Cleaning Oil Strainer

remove dirt and foreign matter which would be liable to cause stoppage of the burners. The strainer may be placed either in the suction line between the supply tank and the pump or in the discharge line after leaving the pump, or both. The strainer usually



The Elliott Twin Oil Strainer

consists of a perforated metal basket mounted in a suitable container, arranged so that the basket can be readily removed for cleaning. The Staples and Pfeiffer so called self-cleaning strainer, which is shown in the illustration, is provided with a by-pass and arranged so that the dirt can be blown out by a steam jet without removing the basket.



Diagrammatic sketch showing the stages through which oil passes between the wells and the refinery, before being delivered to the power house.

In addition to the main strainer on the oil line it is advisable to provide a small fine mesh strainer at each oil burner.

To clean this strainer it is only necessary to turn the handle on top so as to run the oil through the by-pass, place a bucket under the blow-out valve at the bottom and blow steam through by opening the small valve on the side.

In the Elliott Twin strainer, shown above, the body is divided into two compartments, each of which contains a straining basket. By means of a single slide valve at each end, either one of the compartments may be shut off so it can be opened up for cleaning, while the oil is flowing through the other compartment.

## RAILROAD ELECTRIFICATION IN SOUTH AMERICA

An electrification is now under way over the line of the Paulista Railway Company between Jundiaby and Campinas, Brazil, a distance of 45 kilometers, or about 28 miles. But since the road is of double track construction the total mileage, including switches and extra track, amounts to 76 miles.

The equipment, which is to be supplied by the International General Electric Company, consists of 12 locomotives, 8 freight and 4 passenger engines, material for the transmission line and sub-station, and a 3000-volt overhead, of the twenty-century type construction.

This project anticipates further extensions amounting to one hundred additional miles of route which may eventually bring the total electrification up to 128 miles, extending between Jundiaby and San Carlos.

The locomotives will be of the geared type, 3000-volt, direct current. The freight locomotives will weigh 100 tons each, all weight on driving axles, and the passenger engine 120 tons, equipped with two axle guiding trucks at each end.

Power for the operation of the lines will be supplied by the San Palo Light and Power Company at 88,000 volts, 60 cycles.

It is expected that the new line will be in operation in July, 1921.



## SPARKS—Current Facts, Figures and Fancy

(Do you know how much salt there is in the seas or how many people speak the English language? Do you know what country has the greatest spending power or how long it takes to cut a track rail by electricity? These questions are answered on the following page, along with bits of information concerning the industrial development of China and South America. —The Editor.)

It is calculated that the evaporation of the oceans would leave a layer of salt 235 feet thick.

\* \* \*

From 1892 to 1914 California water-power increased from about 600 to nearly 600,000 horsepower.

\* \* \*

The spending power of the Australian population, according to statistics, is higher than that of any other people of the world.

\* \* \*

It is estimated that over 140,000,000 people now speak the English language, over 51,000,000 the French, 75,000,000 German, 35,000,000 Italian, 42,000,000 Spanish, 13,000,000 Portuguese and 75,000,000 Russian.

\* \* \*

The distance from Liverpool to Hongkong is 9,651 miles, whereas the distance from San Francisco to Manila is 6,221 miles, a differential in favor of San Francisco of 3,431 miles, or equal to about twelve days sailing one way.

\* \* \*

Buying milk by the stick sounds like a gingerbread-house fairy tale, but in some parts of Siberia it is an everyday affair. Owing to the somewhat chilly climate most of the food sold in shops is in a frozen state, milk being sold in long sticks and meat hacked with axes.

\* \* \*

It is predicted that instead of 100,000 persons in the factories of China and 4,000,000 children in schools (the estimates for 1918), the China of a few decades hence will have 40,000,000 factory hands and 80,000,000 school children, figures proportionate to the present statistics of the United States.

\* \* \*

A small electric fountain is the latest in table decorations. A little electric motor is directly connected with a small rotary pump that forces the water from the well up into a ring fitted with some 20 small nozzles. About one quart of water is used, and the overflow leaks back again into the reservoir to be used over again. The height of the water is regulated by a valve on the supply ring in the basin.

\* \* \*

An electrically operated compress, which will compress bulky cotton bales 42½ pounds to a cubic foot, is a modern device employed in Los Angeles. The cotton is brought in loose bales and when the compress has been filled the cotton is pressed together with enormous force. This makes it possible to load 200 bales of cotton into one 50-foot freight car. The system has not yet been applied to the passenger service.

A motor operated saw for cutting track rails wherever electricity is available has recently been placed on the market. The machine is of simple construction, consisting merely of a motor and starting box, a supporting frame, a gear and a connecting rod which operates the saw frame. The maker states that the machine will cut a nine-inch girder rail in from 15 to 18 minutes and it is estimated that one blade will cut from eight to ten rails.

\* \* \*

The light and power, and electric-railway companies in Montevideo, Uruguay, have their own shops and do their own repairing. The present freight situation would make the shipment of dynamos and motors to the United States or to Europe for repair exceedingly expensive. It is suggested that a market may be found here for insulated armature coils among consumers who do their own repairing. Montevideo has alternating current.

\* \* \*

Inasmuch as there is no water-supply system for the city of Asuncion, which has about 80,000 population, or for any of the other cities or towns of the republic of Paraguay, there is a constant demand for a limited supply of hand pumps, windmill pumps, electrical and gas pumps to be used in wells. The total value of all pumps imported into Paraguay in a year averages about \$6,000, of which more than half represents imports from the United States.

\* \* \*

Stainless steel is being employed very largely in the manufacture of pump rods, valve spindles, valves, and other parts which are exposed to contact with water, steam, and other corrosives. The scientific-instrument trade is using it for drawing instruments. It is being manufactured into stair rods, saucepans, and pans of varying shapes, fenders for the hearth, and even into poker and garden implements. Sport is also taking an interest in stainless steel and is promoting a demand for golf-club heads, spurs, and so forth.

\* \* \*

A plant for the production of synthetic ammonia, operated entirely by hydroelectric power, has recently been successfully put under way in Italy. Water is decomposed into oxygen and hydrogen by electrolysis. The hydrogen is stored in tanks and conveyed to a receptacle of the size and appearance of an upright hoisting-engine boiler. In this receptacle is carried out a process of which the details are kept secret and which constitutes the essence of the new method for producing synthetic ammonia, and tremendous pressure is then applied to the resultant gaseous products. Ammonia issues from the factory in portable steel cylinders.



## PERSONALS

**James H. McGraw**, president of the McGraw-Hill Company, is a Pacific Coast visitor. The McGraw-Hill Company, in addition to publishing the Journal of Electricity, is the owner of ten other national engineering magazines, among which are Electrical World and Electrical Merchandising, which together with the Journal of Electricity are known to the trade as the McGraw-Hill Electrical Trio. Mr. McGraw is a forceful factor in the development of the educational idea in technical journalism, and today stands foremost throughout the world as the developer of the highest type of engineering technical magazine activity. One of the most powerful impressions made upon the recent vast audiences of the Foreign Trade convention at San Francisco was the paper of Mr. McGraw's which is entitled "Service of the Business Press to Foreign Trade," excerpts of which appear elsewhere in this issue of the Journal of Electricity. Mr. McGraw is accompanied in his present tour by **D. H. Braymer**, managing editor of Electrical World. They both expect to spend some weeks on the Pacific Coast in looking into the splendid new opportunities for the service of technical journalism in this growing section of our country.



**Masakazu Imai**, electrical engineer of the South Manchurian Railway Company, was recently in San Francisco.

**J. C. Barber**, manager of the Citizens Light and Power Company of Ketchikan, Alaska, has been to Seattle on a business trip.

**B. Badrian**, district manager in California for the Hurley Machine Company, is visiting Los Angeles dealers for the purpose of stimulating Thor sales.

**Arthur L. Ives** of the New York firm of Ives and Davidson remained in Los Angeles for several weeks following the Pasadena convention to look after local interests.

**L. R. Ardouin**, secretary of the San Francisco Association of Electrical Contractors and Dealers, has resigned his position with the association to take up the study of law.

**George Barker**, National Carbon Company of San Francisco, and **V. D. Harrison**, Pacific States Electric Company of Seattle, have just returned from an extended business trip through Alaska.

**L. E. Rynearson**, sewing machine specialist for the Pacific States Electric Company, has recently returned to Los Angeles after having spent two months working with dealers in the northern part of the state.

**M. J. Verdery, Jr.**, formerly of the Hurley Machine Company, manufacturers of the Thor washing machine, and later manager, electric range department, of the Great Western Power Company, has recently become associated with the securities department of the Anglo-California Trust Company of San Francisco.

**W. W. Briggs**, formerly of the Westinghouse Electric & Manufacturing Company and of the Great Western Power Company of San Francisco, and now manager of the New York district of the Westinghouse Lamp Company, is spending some time on a visit in San Francisco. On June 9th he gave a most interesting talk before the Downtown Association on his impressions of industry and electrical matters in the West.

**W. L. Strandborg**, publicity manager of the Portland Railway Light and Power Company, has been nominated by the united Ad clubs of the Pacific Coast for the position of vice-president of the Associated Ad Clubs of the World.

**C. E. Magnusson**, professor of electrical engineering and acting dean of the College of Engineering at the University of Washington, was elected a vice-president of the American Institute of Electrical Engineers at the annual business meeting held recently.

**George Patterson** of Stanley and Patterson, New York, and a party of ten are making an extended trip through the West. Their itinerary will include Los Angeles, San Francisco, Seattle and return to the East through Canada.

**Charles H. Peirson**, advertising agent of the Southern California Edison Company, **Fred B. Lewis**, Los Angeles superintendent of the same company, and **A. W. Childs**, superintendent of sales of the southern company were recent visitors in San Francisco.

**Gordon C. Osborne** is now assistant chief of the department of electricity of the city of San Francisco, having been appointed to fill the position formerly occupied by **Ralph H. Wiley**. Mr. Osborne has been connected with the department of electricity for several years.

**O. W. Peterson**, construction superintendent of the Pacific Gas & Electric Company, has left the employ of the company to take charge of the construction of tunnel number one of the Caribou project of the Great Western Power Company. The contract for the driving of this tunnel has been let to the Shattuck Construction Company of San Francisco.

**R. C. Lamphier**, general manager of the Sangamo Electric Company of Springfield, Illinois; **R. E. Gorton**, manager of the Packard Lamp Division of the National Lamp Company of Warren, Ohio; **H. E. Sanderson**, Pacific Coast manager of the Bryant Electric Company, and **Frank Burton**, general sales manager of the same company, were recent visitors at Seattle.

**Frank Vanderlip**, chairman of the American International Corporation and president of the Japan Society of New York, who has headed a group of bankers, manufacturers and business men on a mission to Japan, addressed a recent meeting of the San Francisco Commercial Club and brought out, in a very forceful and helpful manner, how international relations between countries on the Pacific may be better fostered.

**Ralph H. Wiley** has just succeeded **Arthur Kempston** as chief of the department of electricity of the city of San Francisco.

From 1905 until 1908 Mr. Wiley was in the employ of the Pacific Telephone & Telegraph Company in the installation department and left the employ of that company to become superintendent of an independent telephone company. Since 1912 he has been in the department of electricity of San Francisco, starting in as underground engineer in charge of the installation of the present underground system of the department, which amounts to practically 250,000 feet of cable. Mr. Wiley also drew up the circuits and supervised the installation of the signaling system at the new central fire alarm station, in connection with **James M. Barry**, who engineered the power equipment when the station was put into service in 1915. In April, 1917, Mr. Wiley was appointed assistant chief of the department and at the same time continued to perform the duties of underground engineer, which position he held until his recent promotion.





Julean Arnold, commercial attache from the United States to the Republic of China, is making an extended visit on the Pacific Coast with headquarters at San Francisco. In former years he has been perhaps our most prominent figure in developing a new idealism in China and presenting the claims of American engineering enterprise in the development of the great republic of the Far East. Mr. Arnold is a graduate of the University of California with the class of 1902, and has been with the consular service practically entirely since his graduation, and has been many years a resident of China. He speaks the Chinese language fluently, and in his work in the Orient is a powerful aid to the development of electrical trade along with our splendid new growth in all lines of commerce.

R. D. Berst, electric distribution department of the Pacific Gas & Electric Company, has left the employ of the company to accept a position with the southern branch of the University of California in Los Angeles.

F. H. Babcock, G. F. Brown and H. H. Dewey, from the engineering department of the General Electric Company in Schenectady, were recent visitors in Los Angeles where they have been doing some work in connection with the new Big Creek Plant Number Eight, which is the latest undertaking of the Southern California Edison Company.

Ned Dean, a mechanical engineer in the testing department of the Westinghouse Air Brake Company with headquarters in Pittsburgh, Pa., is a recent San Francisco and Pacific Coast visitor. Mr. Dean is a graduate of the University of California and has been engaged in engineering activities of the Westinghouse Company in the East for some years past.

Sir Vincent Raven, chief mechanical engineer of the British railroad systems, accompanied by his chief designer, H. J. Robson and by M. Lydal, consulting engineer of the London and Northeastern Railroad of England, have recently inspected the Chicago, Milwaukee and St. Paul electrification. The British engineers will return to the east by way of California.

C. L. Edgar has accepted the appointment as chairman of the Executive Committee of the Society for Electrical Development. He announces his intention to call bi-monthly meetings of this committee to give close attention to the important matters coming up for consideration, and secure for the electrical industry the full benefit of the great work the society is carrying on.

C. S. MacCalla, formerly general manager of the Washington Water Power Company, is now manager of the Rochester Works of the General Electric Company at Rochester, New York. Mr. MacCalla's new activities are contributing in an effectual way to the advance of the use of electrical appliances, as his firm is manufacturing fractional horsepower motors, such as are used on washing machines.

Howard Spreckels, who has been connected with the accounting department of the Universal Electric & Gas Company at San Francisco since the cessation of the war, has resigned, and after a short business trip East will return to San Francisco as secretary of the Pit River Power Company and will devote his energy and interest to the development of this property, which will shortly add 50,000 kw. to the capacity of the hydroelectric plants in northern California.

A. M. Bohnert, formerly assistant to E. H. Steele, superintendent of transmission of the Pacific Gas & Electric Com-

pany, has joined the force of The Ohio Brass Company at Mansfield, Ohio, as sales engineer. Mr. Bohnert has been with the Pacific Gas & Electric Company for the past eight years, with the exception of two and a half years during the war when he was Captain of Engineers, U. S. Army, acting as Assistant in charge Electrical Mechanical Section, Office Chief Engineer, A. E. F., France.

Howard Elliott and L. B. Stillwell, two engineers, have been elected as directors of the Chamber of Commerce, U. S. A. Mr. Elliott is a member of the American Society of Civil Engineers and chairman of the board of the Northern Pacific Railway, New York City. Mr. Stillwell is a past president of the American Institute of Consulting Engineers and of the American Society of Electrical Engineers, a member of the American Society of Civil Engineers and an electrical and consulting engineer, New York City.

Paul McKee, vice-president and general manager of the California-Oregon Power Company, has only recently been elected to this new position due to the financial reorganization of the company. Mr. McKee is one of the young men of the industry and many constructive things are looked forward to as a result of his able efforts in behalf of the industry. The company, under its reorganization plan, is wiping out any question of improper financing and under the new basis only actual physical assets will be represented.

E. M. Herr of Pittsburgh, president of the Westinghouse Electric & Manufacturing Company, and L. A. Osborne of New York, president of the Westinghouse Electric International Company, were recently decorated by the Emperor of Japan with the Order of the Rising Sun. These American manufacturers have been several months in Japan studying Oriental conditions. The Order of the Rising Sun is the highest honor the Emperor can bestow. Mr. Herr received the third class and Mr. Osborne the fourth, the higher classes being awarded only to Japanese national heroes.

John B. Fiskien, consulting engineer for the Washington Water Power Company and president of the Northwest Electric Light and Power Association, was a recent San Francisco visitor. Mr. Fiskien has now returned to his headquarters at Spokane, Washington, after a delightful attendance at the recent N. E. L. A. Convention at Pasadena, California. Much interest is now being centered in the West on the forthcoming convention of the Northwest Association which is to meet in Spokane during the middle of September of this year, and in which Mr. Fiskien's well known executive ability is expected to play a most helpful part.



E. W. Garsher, on the left, and J. J. Langnair, on the right, lighting engineers with the General Electric Company, San Francisco, have been unusually successful in introducing the electrical idea into the public school through the school entertainment. The story of the entertainment given recently at the Francis E. Willard School in Berkeley, which appears in this issue of the Journal of Electricity, is an example of the type of work they are doing to show the public what satisfactory effects may be obtained through the correct application of electrical illumination.



## Meeting Notices for Electrical Men

(The program of the Pacific Coast Convention of the A. I. E. E., which will be held July 21-24, and the plans which have been made for the annual meeting of the California Association of Electrical Contractors and Dealers, to be held June 24-26, are given in the following pages. A. I. E. E. and A. S. M. E. activities in San Francisco and in the Northwest also appear along with announcements concerning Illuminating Engineers and San Francisco Commonwealth Club activities.—The Editor.)

### San Francisco Electrical Development League

There was a large attendance at the May twenty-fourth meeting of the San Francisco Electrical Development League to hear the message of W. L. Goodwin and Harry Kirkland. Previous to the regular talks Chairman E. O. Shreve called upon Lee H. Newbert, newly elected president of the Pacific Coast Section N. E. L. A., to congratulate him, and asked for a few remarks regarding the success of the convention at Pasadena. A. C. McMicken, sales manager of the Portland Railway Light and Power Company announced that the Pacific Coast Convention of the A. I. E. E. was to be held in Portland from July twenty-first to twenty-fourth inclusive and asked for a large representation from California.

Samuel H. Taylor, Electric Railway and Manufacturers Supply Company, who was chairman of the day, announced Harry Kirkland of the General Electric Company by stating that the day would tell the League how a California-made product was being spread through the East. Harry Kirkland spoke on "Fellowship" and said that at the two wonderful conventions held at Pasadena the electrical men of the East had a chance to see in action the ideas that Bill Goodwin had been trying to spread throughout the East, and that the California spirit had been proven to the Easterners, who would go home convinced that the cooperative plan could be worked out successfully.

"Bill" Goodwin was given a royal welcome when he arose to speak, and though the demonstration rather disconcerted him at first, he soon found himself and started telling the various branches of the industry in no uncertain terms just what was the matter with them. He began by telling of his work in the East, and said that California had been held up as an example to the East and that while some of the things he told the East had been discounted for that reason, the men who attended the convention would return convinced and his message would be accepted. In pointing out the problems that confront the industry Mr. Goodwin said that these problems were being solved faster in the West than anywhere else, but that they were still big problems out here and the first and most important of them to be solved was the question of acquiring finances for the development of our hydroelectric resources. Speaking of the responsibility of the press he said: "The Journal of Electricity is the mouthpiece of the Pacific Coast where the cooperative plan has been successfully worked out, and the Journal has grasped the idea of this cooperative plan and has done a lot to help it along. There-

fore see to it that this journal is planted in of your Eastern offices to get this message across east of the Rockies. There is the real human spirit in the Journal of Electricity, which is the difference between the publications of the East and the West."

He summarized the problems of the industry under four heads: the need for funds, the necessity for right thinking in the industry, the electrification of railroads, and the development of the electrical retail merchant.

Mr. Samuel Adams Chase of the Westinghouse Electric & Manufacturing Company was scheduled as one of the speakers, but was unable to attend the meeting on account of illness. The Development League through the chairman of the day sent a message of regret to Mr. Chase and best wishes for a speedy recovery.

### San Francisco Section, A. S. M. E.

The meeting of the San Francisco Section, American Society of Mechanical Engineers, held at the Engineers' Club on May twenty-seventh was addressed by Mr. F. A. Foster, instructor in mechanical engineering at the college in Peking.

The talk was illustrated by a series of lantern slides showing the methods used in China by the various trades, including carpenters and metal workers, and in the various textile and flour mills. Mr. Foster has just returned from China after being in that country for over ten years, and is thoroughly conversant with conditions there.

### Spokane Section, A. I. E. E.

The annual dinner of the Spokane Section of the American Institute of Electrical Engineers was held at the Davenport Hotel in Spokane on the evening of May twenty-first. Following the dinner the annual election of officers was held, the rest of the evening being given over to a paper by Charles A. Lund, distribution engineer of Tacoma, who spoke on "Public Utility Valuation."

### Illuminating Engineers Organize in San Francisco

The earnest interest in better lighting standards of the twenty-five members of the Illuminating Engineers Society residing in the bay district was shown when nearly twenty of them gathered in San Francisco for the first time on May 29 in honor of the visit of S. E. Doane, president of the society, and to take the necessary steps to form a San Francisco branch.

Since 1915 the Coast representative of the society, Romaine Myers, has been instrumental in achieving the following accomplishments: California Industrial Lighting Laws, which have been considered the standard for other states;

### BUILDERS OF THE WEST — LXXIX



BENJAMIN HOLT

The tank proved to be not only the sensation of the war, but an effective weapon in meeting the issues of combat, and to the West must go the credit for this triumph of modern warfare. To Benjamin Holt, inventive genius of the West, whose faith in the "caterpillar" has proven so steadfast since the earliest experiments with his invention, this issue of the Journal of Electricity is affectionately dedicated; not so much, however, for his contribution to the sinews of war as for the revolutionary methods that his genius has brought forth in the application of the tractor upon the farm, enabling the West to pass to vast new planes of accomplishment in agricultural development.



automobile headlighting laws; the preparation of several school lighting exhibits, and plans for permanent industrial lighting demonstrations in San Francisco and Los Angeles.

In addressing the meeting Mr. Doane, who is chief engineer of the National Lamp Works of the General Electric Company, stated that one of the fundamental problems confronting the illuminating engineers was to educate the public in the nomenclature of the art. While the engineers themselves have a clear conception of these they seem to lack a way of expressing them to the non-technical consumers.

He pointed out the possibility of confusion arising through the fact of so much attention being given to industrial lighting demonstrations throughout the country, unless equal stress is laid on the subject of home and shop lighting. The home is as much of an industrial establishment as is the factory, and exhibits of proper home lighting should be installed simultaneously with the others.

Mr. Doane outlined the activities which are now being followed by the society. These are generally for the wider distribution of the highly specialized knowledge at the command of the society. Among these are the following:

1. Education committee: (a) College education, (b) Grade school education, (c) Correspondence schools. 2. Reciprocal relations committee, which is attempting to have illumination committees as part of the activities of each of the other national societies. 3. Compilation of symposiums on various subjects from the publications of the Society. 4. Decentralization of the Society for the further benefit of the membership at large.

A committee consisting of L. E. Voyer, chairman, J. A. Vandegrift, H. H. Millar, Miles Steele and Romaine Myers, was chosen to draw up the necessary by-laws and petition to the Society Council requesting that a charter be granted the San Francisco branch.

#### British Columbia Contractor-Dealers' Convention

British Columbia electrical contractors and dealers, central stations, manufacturers and jobbers held an enthusiastic convention at Vancouver, B. C., on May 31 and June 1 at which cooperation, advertising and optimism were the leading features discussed. "Bill" Goodwin was the central figure among the visitors. He was accompanied by Harry Kirkland, general manager of the American Conduit Company, O. H. Caldwell, editor of *Electrical Merchandising*, and M. K. Pike, general sales manager of the Northern Electric Company of Montreal. The chairman was E. Brettell, president of the Vancouver Electrical Contractors and Dealers' Association.

The convention was opened by an address by Mayor R. H. Gale. He was followed by O. H. Caldwell. Mr. Caldwell urged the electrical industry to advertise its wares. One of the suggestions he made was for the standardization of electrical instruments, such as plugs. He said an investigation had shown there were 37 different kinds on the market and that the kind with two parallel blades was the best.

W. L. Goodwin in a few preliminary remarks pointed out the necessity for cooperation, the lack of which had lost business to hardware stores and department stores. He criticized the local association for adopting the motto of "Reliable repair service," saying that electrical apparatus should not need repairing.

"Electrical appliance stores," he said, "must become more attractive to the public in order to secure the business which is rightfully theirs."

The afternoon session on the first day was taken up by an address by Harry Kirkland, substituting for Sam Chase, and by a discussion on the "Problem of the Electrical Contractor" by Mr. Goodwin. Mr. Goodwin urged the abandonment of shady practices and the competitive system of bidding. He told of one local contract which was obtained on a price of about \$190 while the extras came to about \$2,000. He said:

"The electrical contractor who makes his business pay on the bidding basis has been the man in the major number of instances who has been successful through selfish, deceptive practices in eliminating from

nearly every set of specifications about one-half of those things which would justly make the installation of added electrical appliances in the ordinary house impossible, for the reason that just 5 per cent of the houses on the entire western continent are, through his collective manipulations, rendered unfit by reason of poor quality wiring and installation, to receive much needed addition in the way of modern electrical appliances.

"By its very nature, the business of contracting is one that permits of sharp practices. Electrical contracting is not and never was a strictly legitimate business. Real specifications, prepared in an intelligent way, would prevent the contractor tearing down, pulling out or eliminating the majority of items. He is constantly taking off his bill of materials, substituting the proverbial 'something just as good,' with whatever will cut into the cost price of the real thing. He is quite unwilling to work on a time and material basis—the only way in which the consumer gets his money's worth—for then he gets exactly what he pays for."

Mr. Goodwin went into details of merchandising and advertising at the evening banquet, using his well-known charts. Other speakers were O. H. Caldwell, W. W. Fraser, Karry Kirkland, Harry Pim, local manager of the Canadian General Electric Company, and E. Brettell, chairman.

The banquet was enlivened by the Northern Electric troupe of minstrels, led by W. C. Mainwaring, sales manager of that company.

Following a further discussion of the contracting problem by Mr. Goodwin on the second day of the convention, addresses were made by E. E. Walker, sales manager of the B. C. Electric Railway Company, and James Lightbody, publicity manager of the same company.

Mr. Walker said that his company sold about \$130,000 worth of electrical merchandise in a year but saw no reason why the sales of the combined electrical trade in Vancouver should not be \$500,000 a year.

The subject of Mr. Lightbody's talk was "Cooperative Merchandising" on the plan carried out in California. He urged that every element in the electrical industry should combine to put over the electrical idea, so that electrical appliances should be as common in homes as gramophones.

"Electrical merchandising is what you make it," he said. "The business is not ready made. You must reach out and grasp it. If you advertise individually, your advertisement will be lost. If you combine on a cooperative page, you will increase the pulling power of your advertisements."

Mr. Goodwin expounded further upon the California Cooperative Campaign and advocated the formation of a similar body in Vancouver with such help in the composition of advertising and organization of sales campaigns as could be obtained in voluntary bodies.

The luncheon on the second day was a joint session with the Rotary Club of Vancouver, which was addressed by Mr. Goodwin. He emphasized the necessity of electrical development if the community was to progress. He further urged a square deal not only to central stations but also to street railways and telephone companies, as the ability to obtain capital for electrical development was linked up with public opinion as regards every other branch of the electrical industry.

The delegates then embarked on the "Britannia" which was chartered by the British Columbia Railway Company and enjoyed a trip to Indian river, past the power plants of the British Columbia Electric Company. The guests sat down to refreshments in the Wigwam Inn before returning to the city.

In the evening of the same day, the delegates joined in a banquet and cabaret held under the auspices of the Vancouver Electric Club.

The committee in charge of the convention was composed of—

E. Brettell, Electric Supply Company, Vancouver.  
J. F. Little, manager, Northern Electric Company, Vancouver.  
S. E. Jarvis, Jarvis Electric Company.  
R. G. Hargreaves, secretary, Vancouver Electrical Contractors and Dealers' Association.  
W. W. Fraser, Electrical Contractor.  
E. E. Walker, sales engineer, B. C. Electric Railway Company.





One of the magnificent views to be seen from the Columbia River highway a short distance from Portland, Oregon, where the Pacific Coast Convention of the A. I. E. E. is to be held.

#### PACIFIC COAST CONVENTION, A. I. E. E.

The Pacific Coast Convention of the American Institute of Electrical Engineers which is to meet in Portland, Oregon, from July 21st to July 24th, has laid out an excellent program of technical papers and has provided for the entertainment of the delegates and visiting ladies.

On Wednesday, July 21st, there will be three papers presented on suspension insulators: "The Design and Application of Suspension Insulators," by W. D. A. Peaslee, electrical engineer of the Jeffery-Dewitt Insulator Company; "Unit Voltage Duties in Long Suspension Insulator Strings," by Harris J. Ryan and Henry H. Henline of Stanford University; and "Electrical Characteristics of the Suspension Insulator at the Higher Voltages," by F. W. Peek, consulting engineer, General Electric Company, Pittsfield, Mass. Discussion of the three papers on suspension insulators will be combined. During the evening the delegates will be taken on an automobile tour over the scenic highways and boulevards of the city.

The following papers will be presented on Thursday: "Railway Electrification," by Renier Beeuwkes, electrical engineer, Chicago, Milwaukee and St. Paul Railroad; "Bridge Methods for Alternating Current Measurements," by D. I. Cone, Pacific Telephone & Telegraph Company; and "Sawmill Refuse, Fuel Oil and Pulverized Coal," by Darrah Corbet, Chas. C. Moore and Company, Engineers.

The morning session on Friday, July 23, will be taken up with the reading of two papers, one on the "Power Factor Correction on Distribution Systems," by D. M. Jones, General

Electric Company, Schenectady, N. Y., and the other, "Use of Special Steels in Pressed Steel Transmission Line Fittings," by L. R. O'Neill, chief engineer of the Maryland Pressed Steel Company. The afternoon will be given over to golf, a tournament being held for the John B. Fiske Cup. For those who do not golf a trip has been planned along the



These falls near Portland, Oregon, are an example of the many beautiful points which A. I. E. E. convention delegates will be interested in visiting.

scenic Columbia River Highway, dinner being served at the Crown Point Chalet.

Tours of inspection to the steam and hydroelectric plants of the Portland Railway Light and Power Company and the Northwestern Electric Company have been planned for Saturday morning, and to other points of interest in and around Portland.

Section officers and chairmen of the convention committees are as follows:

Acting chairman—E. F. Whitney, General Electric Company, Portland.  
 Secretary—W. C. Heston, Portland Ry. Light & Power Co.  
 General Convention Committee—R. M. Boykin, North Coast Power Co.  
 Arrangements Committee—J. E. Yates, Pac. Power & Light Co., Portland.  
 Entertainment—R. F. Monges, General Electric Company, Portland.  
 Program—O. B. Coldwell, Portland Ry. Light & Power Co.



Oregon City Falls of Oregon City, Oregon, which is one of the many beautiful falls of the Pacific Northwest.

#### COMING CONVENTIONS

American Institute of Electrical Engineers—  
 Portland, Oregon. —July 21-24  
 American Society of Civil Engineers—  
 Portland, Oregon. —August 10, 11  
 Northwest Electric Light and Power Association—  
 Spokane, Washington. —September 15-18



### Annual Meeting of Contractor-Dealers

Extensive plans are being made to insure the success of the annual meeting of the California State Association of Electrical Contractors and Dealers which is to be held at San Jose from June 24th to 26th, at the Hotel Vendome. The executive committee meeting will be held Thursday night, June 24th, and Friday will be given over to the business meetings. The main business on Saturday morning will be the election of officers of the state association for the coming year.



Cup presented by E. J. Crilley to be awarded at the June golf tournament.

The entertainment committee has provided for card parties and swimming contests for the ladies, with suitable prizes.

Sunday afternoon there will be a golf tournament for a cup that has been presented by E. J. Crilley of the Habirshaw Wire Company, and

Saturday night there will be a dinner dance in honor of the newly elected officers. Hotel reservations must be made through the office of the state secretary.

The following committees have been appointed to handle the meeting:

#### Committee on Arrangements:

E. E. Brown, Brown-Langlais, San Francisco.  
T. J. Bennett, Rex Electric Company, San Francisco.  
Charles Fazer, Fazer Bros., San Jose.  
B. F. Fanning, Crow-Fanning Co., Los Angeles.  
H. W. Kimball, Kimball Electric Company, Oakland.  
M. L. Scobey, Home Electrical, San Francisco.

#### Ladies' Entertainment Committee:

A. E. Rowe, chairman, Garnett Young Company, San Francisco.

#### Nominating Committee:

G. E. Arbogast, F. E. Newbery Company, Los Angeles.  
H. L. Miller, H. L. Miller Company, Pasadena.  
H. H. Courtright, Valley Electric Supply Company, Fresno.  
W. H. Gribble, Western Gas and Electric Appliance Co., Chico.  
C. B. Kenny, NePage-McKenny Company, San Francisco.

### Fishermen and Near Fishermen at the Recent Convention of Electrical Supply Jobbers, Del Monte, California

Note the honest open countenances of the fishermen and the guilty look on the faces of the "fakirs." Take, for instance, Number 3 from the left in the first view, which

shows J. J. Keith of the Altorfer Brothers Company, with its serious mien as compared with the smiling, open countenance of J. O. Wetherbie of the General Electric Company, appearing on the extreme right in the second view. Anyhow, there is just a little fish shown in the picture even though they didn't catch it themselves.

### Commonwealth Club to Hold Water Resources Meeting

At the June 17th meeting of the Commonwealth Club of San Francisco the question of the development of water resources will be discussed by eminent authorities on each particular branch of the subject. There will be five papers presented, all of which will deal with the necessity for a comprehensive plan for the early development of the water resources of California which is a most important factor in assuring the future prosperity of the state. The first paper will be presented by John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, and R. H. Ballard, vice-president and general manager of the Southern California Edison Company, and will show what the development of water power in the past has meant to the state. It will also include a statement of the present annual demand for power, the estimated cost to meet this demand in the future and a description of the projects now in process of construction.

Frank Adams, irrigation manager of the local office of the U. S. Department of Agriculture, will give a paper on what the use of California's water supply for artificial irrigation means to the state. H. G. Butler, power administrator of the California Railroad Commission, will tell of the undeveloped water resources of California. C. H. Lee, chairman of the California Water Commission, will show the present great activity in the use of water as shown by the applications made to the California Water Commission. The last paper will be on the obligation of the public to supply funds for the development of these natural resources fast enough to keep pace with the growth of the state, and will be read by Paul Sinsheimer, vice-president of the Union Trust Company of San Francisco.

### Electrical Subjects at Los Angeles Ad Club

Col. Chas. W. Decker, well known in electrical circles, presided at the Los Angeles Ad Club luncheon on May 25th. Two of his speakers talked on electrical subjects, Mr. P. L. Thompson, advertising manager of the Western Electric Company talking of our Cooperative Campaign and Mr. Montaville Flowers presenting a powerful appeal for civic independence in which was included a forceful denunciation of municipal ownership.



Fishermen

1. A. E. Legge, Public Service Company, Chicago. 2. R. P. Tillotson, Appleton Electric Company, Chicago. 3. J. J. Keith, Advertising Manager, Altorfer Bros. Co., Peoria, Ill. 4. R. E. Gorton, Packard Lamp Company, Warren, Ohio. 5. C. A. Harding, Commonwealth Edison Company, Chicago. 6. W. F. Bissell, The F. Bissell Co., Toledo, Ohio. 7. L. W. Kittman, Electric Supply Jobbers Association, Chicago.



Near-Fishermen

1. R. P. Oblinger, Ind. Electric Supply Co., Indianapolis, Ind. 2. Jas. Clark, Jr., J. Clark Jr. Elec. Co., Louisville, Ky. 3. H. E. Rasmussen, Ind. Electric Supply Co., Indianapolis, Ind. 4. C. J. Litscher, C. J. Litscher Electric Co., Grand Rapids, Mich. 5. B. B. Downs, St. Paul Electric Co., St. Paul, Minn. 6. J. O. Weatherbie, General Electric Company, Schenectady, N. Y.



## HAPPENINGS IN THE INDUSTRY

### POWER RATES IN JAPAN

The cheapness of electric power in Japan, which has been one of the factors in its rapid industrial development, is shown by the fact that even after a recent raise in rates by the Nagoya Electric Light Company, which supplies the larger industrial companies of Nagoya with electric current, the prices will range from only 0.8 cent to 1.3 cents per kilowatt-hour. This raise is supposed to operate for a period of two years and supersedes the former rates, ranging from 0.5 cent to 1 cent per kilowatt-hour. The increase of even such low rates met with strong opposition from the companies using the current, but it is believed that the raise will be sustained on account of the shortage of power, not only in Nagoya but throughout the country.

### SKAGIT RIVER PROJECT AUTHORIZED

Authority has been granted to the city of Seattle by the United States Department of Agriculture to proceed with the Skagit River Development. In the authorization of the project the city is given a perpetual right to the waters of the Skagit River as a source of light and power for the city, with the stipulation that the city would start work on the project before December 2, 1920, and that the work would be completed before December 22, 1922. The government in turn agreed that the permit would be enjoyed by the city without charge to the extent that the power to be generated by the plant be "sold to the public without profit or used by the permittee for municipal purposes."

The Gorge Creek project which is specifically authorized in the permit when completed will consist of a masonry dam across the Skagit River, a tunnel to conduct the water through the mountain to the power plant two miles away and a power house with a capacity of 50,000 horsepower. Preliminary work on the project, which has already been started, will necessitate the construction of a railroad twenty-six miles in length and the installation of a 3,000 hp. unit to furnish power for the construction work.

The first of the bonds for this project have been put on sale by the city comptroller. These are a part of the \$5,500,000 issue authorized by the recent election and are in the denominations of \$100, \$500 and \$1,000 at par value. They pay six per cent and it is hoped that a large number of the citizens of Seattle will purchase them and so become interested financially in the city's utilities.

### APPLICATION TO PURCHASE COMPANY

The Yuma Light, Gas and Water Company wants to buy the electric and water plant owned by the Winterhaven Improvement Company and giving service to the residents of Winterhaven, Imperial county. The Winterhaven company wants to make the deal and both companies have joined in an application to the Railroad Commission asking for an order approving the transaction. The Winterhaven company says that it is unable to give proper service on account of the small number of consumers. The Yuma company serves the town of Yuma and also the territory on the California side of the Colorado river near Yuma, including the U. S. Indian school.

### BUSINESS MEN TO ASSIST POWER COMPANY

A group of business men of Baker and Union counties, Oregon, are promoting a scheme to erect a power plant that will cost \$200,000. The plant will be leased to the Eastern Oregon Light and Power Company which will stand half of the construction cost of the new plant.

### BRITISH COLUMBIA COMMISSION DISSOLVED

The repeal of the Public Utilities Act of British Columbia, by the legislative assembly of the province, has brought out serious charges against the provincial government by the former commissioner, Major J. L. Retallack. The major has made the charge that the principal reason for the dissolution of the commission was to get rid of him as he was not sufficiently plastic in the hands of the politicians. Quoting from the act passed at the recent session of the legislature, Major Retallack emphatically asserted that instead of repealing, the act had merely suspended the act under which he was appointed, and that under the repeal act the executive could, from time to time, appoint a new commissioner to deal with any of the matters handled by himself as public utility commissioner, including the six-cent fare inquiry, if jurisdiction over the British Columbia Electric Railway system is restored. The reasons given by the legislature for the repeal of the public utility act were that the Dominion Public Utility Commission had taken jurisdiction over the public utilities in the province and that the continuation of the provincial public utilities commission at an expense for the coming year of \$25,000 was not justified.

### ATTACHMENT PLUG DECISION

In the suit of Harvey Hubbell, Inc., against the Bryant Electric Company for infringement of the Hubbell patents for attachment plugs, the Circuit Court of Appeals for the Second Circuit has handed down an opinion in favor of the Bryant Electric Company, holding that the Bryant Spartan line of plugs and receptacles do not infringe the Hubbell patents. The Appellate Court orders the bill of complaint to be dismissed with costs of both courts to be paid by the plaintiff.

This means that the Bryant Electric Company can continue to make the various parallel and tandem slot receptacles of the Spartan Interchangeable line as they have always made, and that such devices have not infringed, and do not infringe Hubbell patents.

In a further decision rendered at the same time in the matter of the Burton patent which covered the combination of parallel and tandem slots in one device, the court held said patent invalid—but this does not affect in any way the continued manufacture and sale of Spartan devices.

### EDISON GIRLS HAVE JINKS

Determined not to be outdone by the entertainments given by the men from time to time, the girls of the Southern California Edison Company, two hundred in number, gave a high jinks on the evening of May fifth in the assembly room in the Edison Building, Los Angeles. In addition to the customary features of vocal and instrumental music there were some distinct novelties presented for the diversion of the young ladies. One of these unique features was a jazz orchestra composed of fake instruments which looked real enough but sounded like singing through a comb. The party closed with the service of refreshments.



Girls of the Southern California Edison Company



# Engineering Committee Report, Pacific Coast Section, N.E.L.A.

(The activity of technical organizations in carrying on research work is of inestimable benefit to the electrical industry, and nowhere is this better evidenced than in the committee work of the National Electric Light Association. Following is the report of the Engineering Committee, Pacific Coast Section N. E. L. A., showing work accomplished during the past year. —The Editor.)

The engineering committee of the Pacific Coast Section of the N. E. L. A. for the year 1919-1920 was as follows:

P. M. Downing, chairman, Pacific Gas & Electric Company; H. A. Barre, Southern California Edison Company; G. E. Armstrong, Southern California Edison Company, now associate editor, Journal of Electricity; J. P. Jollyman, Pacific Gas & Electric Company; S. J. Lisberger, Pacific Gas & Electric Company; J. A. Koontz, Great Western Power Co.; E. A. Quinn, San Joaquin Light & Power Corp.; J. E. Woodbridge, Sierra & San Francisco Power Co.; W. M. Shepard, California-Oregon Power Co.; C. O. Poole, Southern Sierras Power Co.; E. R. Northmore, Los Angeles Gas & Electric Co.; L. M. Klauber, San Diego Cons. Gas & Electric Co.; R. L. Eltringham, State Industrial Accident Commission; John Hood, General Electric Company; W. P. L'Hommiedieu, Westinghouse Electric & Manufacturing Company; R. S. Masson, Consulting Engineer; P. M. Wentworth, Reno Traction Water & Power Co.

It has been the endeavor of this committee during the past year to keep in touch with the technical or engineering problems that have come up and which seem to be of importance to industry generally. The work has been carried on through sub-committees appointed with due regard to the qualifications of those selected to represent the Section on the particular matters involved. Some of the work handled by the committee during the year is as follows:

(1) The sub-committee consisting of S. J. Lisberger, chairman, R. Cunningham, L. M. Klauber, H. A. Barre and J. E. Woodbridge, appointed in 1917 to represent the section at the conference called for the purpose of drafting new line construction code of rules to be submitted to the Railroad Commission for use as the basis of an order to supersede its General Order No. 26, has been continued during the year. This sub-committee has had a number of meetings with representatives of the Railroad Commission, the State Industrial Accident Commission, the Insurance Underwriters, various municipalities, labor organizations and others interested in the subject. The result has been a formulation of a tentative code that has been submitted to the Railroad Commission for its consideration. Although not as voluminous as the code prepared by the Bureau of Standards, nevertheless it is felt that in its present form it covers the subject fully, and provides a construction ample to meet every condition found in this state, without imposing restrictive conditions, the cost of which would be very materially in excess of present day costs and make the extension of lines into new and sparsely settled territory almost prohibitive.

The first informal conference to consider this code was held in the office of the Railroad Commission on April 20, 1920.

(2) On October 6, 1919, the Bureau of Standards at Washington called another general meeting of the various wire using utilities and others interested in the safety code being prepared by that body for a further discussion and possible revision of same. The meeting was held in Philadelphia on October 28, 1919. The Pacific Coast Section was invited to have representatives in attendance at the meeting and Messrs. H. A. Barre of the Southern California Edison Company and S. J. Lisberger of the Pacific Gas & Electric Company were appointed to represent the Section. The conference was in session several days without reaching an agreement. Reports indicated a considerable difference of opinion among the various interests represented as to the necessity or propriety of attempting to formulate into a single code, specifications that would be universally applicable to all of the climatic and other conditions obtaining throughout the United States.

(3) The work of the committee representing the Pacific Coast Section at the conferences called by the State

Industrial Accident Commission to consider the revision of the Utilization Code, is nearing completion. The various central station companies in both the north and south are ably represented at these conferences, but before the code is issued as a final order, the Commission expects to submit it in tentative form to the various interests concerned and will hold a formal hearing to receive comment and criticism.

(4) By far the most important work done by the engineering committee during the year has been the continuation of the study of line insulators and line insulation under the direction of Prof. Harris J. Ryan of Stanford University. J. A. Koontz, H. A. Barre, J. P. Jollyman and J. E. Woodbridge have given this work their careful and earnest attention, the results of which are outlined in a report presented by the Overhead Committee of the National Association. In this connection, it is fitting that proper credit be given to Prof. Ryan and the University authorities for the interest they have taken in this work. The electrical industry is indeed fortunate in having a man as eminently qualified as Prof. Ryan to handle this very important and difficult problem from a purely scientific standpoint. A great deal of interest is being displayed in the progress of this work, not only by the operating companies but also by the insulator manufacturers, and it is to be hoped that out of the investigation that is being so ably carried on by Prof. Ryan, there will come a solution of the problem of line insulation that will permit the use of voltages not possible with present-day equipment.

(5) J. E. Woodbridge represented the Pacific Coast Section at the meeting of the Inductive Interference Committee of the National Association held in Denver on December 1, 2 and 3, and L. M. Klauber represented the Section at the meeting of the overhead systems committee held at the same time and place.

(6) At a meeting of the Prime Movers Committee held in Pittsburgh January 12, J. A. Koontz represented the Pacific Coast Section. S. J. Lisberger represented the section at a meeting of the Apparatus Committee held in Louisville, Ky., on January 15, 16 and 17.

Inasmuch as full reports of the activities of these various national committees was made at the meeting of the National Association, no attempt will be made at this time to outline the scope of the work covered or the results obtained.

## TRADE NOTES

### Western Agency —

The Montelius Price Company of Seattle have recently taken over the the agency of the Roller-Smith Company for the Pacific Northwest and will handle their line of electrical instruments, meters and circuit breakers in the states of Washington, Idaho and part of the state of Oregon.

### New Quarters —

The Chicago Fuse Manufacturing Company have recently moved into new quarters in Chicago, taking over a modern two-story building with a floor space of 125,000 square feet. This is said to be the largest factory in this country engaged in the manufacture of fuses and switch boxes.

### Lighting Fixture Agent —

A. M. Lloyd has recently become Pacific Coast agent for Miller and Company, manufacturers of lighting fixtures, with Western sales office in San Francisco.

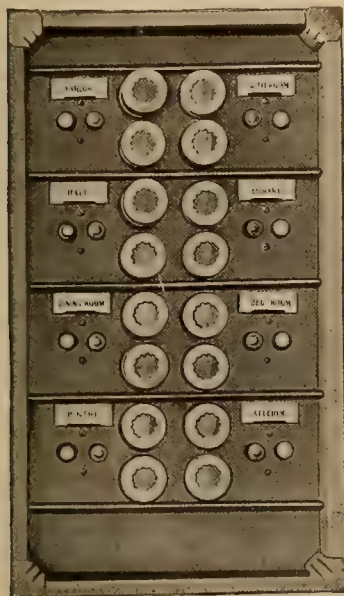


## LATEST IN EVERYTHING ELECTRICAL

(The safety fuse panel which is described on this page is especially convenient where panels without switches are desired. The indicator cord hook which is also described and illustrated enables the engineer to connect the indicator cord with the cross-head of a high speed engine as easily and quickly as with a low-speed engine.—The Editor.)

### A NEW SAFETY FUSE PANEL

For apartment or residential use, where distributing panels without switches are desired, the Westinghouse Electric & Manufacturing Company has developed a new type, known as the type "F" safety fuse panel.



The new type "F" safety fuse panel

The plug fuse holders of this panel are mounted on a slate base and a moulded micarta cover is provided through which the fuse holders alone project, all other parts being completely covered. When the fuses are in place, therefore, everything accessible is dead so that accidental contact with live parts is impossible. By removing this cover, however, all terminals are exposed so that the installation of the panel

and repairs of any kind are very simple matters.

Another feature of this panel is that it is the narrowest panel of its type on the market. It is made for two and three wire mains of from 30 to 200 amperes in capacity, 125 volts. The number of circuits range from four to thirty-two. Main fuses or a safety-type main switch can be added if desired.

### A HANDY INDICATOR CORD HOOK

A very simple and ingenious indicator cord hook has been developed and patented by the Trill Indicator Company, Corry, Pa., which enables the engineer to as easily and quickly connect the indicator cord with the cross-head of a high speed engine as with a low-speed engine.

Experienced engineers appreciate the difficulties and dangers involved in connecting the ordinary indicator cord to the standard on a cross-head. This is especially true in cramped places and on high speed engines. Not only does the engineer risk his life, but there is danger that the indicator may be wrecked.

Numerous devices have already been designed for safely accomplishing this feat, but these devices, although more or less successful, have proved cumbersome and expensive.

The accompanying illustrations clearly show how the patented Trill Cord Hook is attached while the engine is running. The loop of the hook is held between the thumb and the finger in such a position as to allow the pin on the standard to strike the straight part of the hook when the standard is within about one inch of the end of its travel. The hook swings about the thumb and finger as a pivot as illustrated in Fig. 1, which action shoves the hook downward. At that instant the piston has reached the end of its stroke. On the return stroke, the pin on the standard engages the hook as illustrated in Fig. 2, and the attachment is complete. The

operation is very simple, and there is absolutely no danger involved.

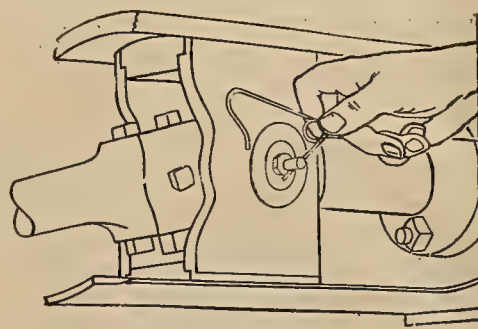


Fig. 1

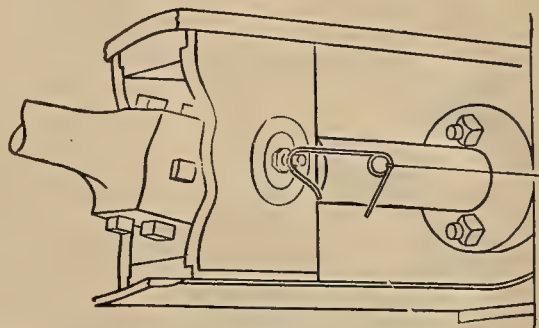


Fig. 2

Illustrations showing how the patent Trill Cord Hook can be attached while the engine is running. In Figure 1 the method of making the connection is shown while Figure 2 shows the completed attachment.

## Book and Bulletins

### Bulletin on Rubber Insulated Wire

The Standard Underground Cable Company, with general offices in Pittsburg and western offices in Oakland, have issued two interesting publications in the interest of that Wire." This gives a complete list of the various types of rubber insulated wire manufactured as well as several illustrations and view of some of the larger buildings in whose construction Standard Rubber Insulated Wire has been used.

### Bulletin on Boiler Insulation

The Celite Products Company of 11 Broadway, New York, is issuing an interesting bulletin known as B-6a describing the insulation construction of different types of boilers. The bulletin is illustrated with diagrams and views of various installations. Copies will be sent on request to all persons interested.

### Chamber of Commerce Publications

The San Francisco Chamber of Commerce last month issued three interesting publications in the interest of that city's welfare. In one of these, called "Industrial San Francisco," a two-page spread is devoted to showing the sources of electric power which operates San Francisco's industries. A large relief map shows the numerous transmission lines that carry 350,000 hydroelectric horsepower from stations in the Sierra Nevada mountains to factories on San Francisco Bay.



## NEW ELECTRICAL DEVELOPMENT

(Plans for the installation of municipal light and power plants, news of the traction controversy in Seattle and a report of water power development in Alaska appear among items from the Northwest. Reports from the Pacific Central district include news that the Lake Spaulding reservoir in the high Sierras is rapidly filling with water and that application has been made for right to purchase extensive rights on the Fall River; while items concerning the organization of an electric power district and the construction of transmission lines and power houses appear among Southwest and Intermountain reports.—The Editor.)

### THE PACIFIC NORTHWEST

**MALIN, ORE.**—The matter of installing a municipal light and power plant is being considered.

**GRANDVIEW, WASH.**—The Pacific Power & Light Company proposes to construct a sub-station at this place.

**SEATTLE, WASH.**—A contract for ten air compressors has been awarded by the city to the General Electric Company at \$3,390.

**EVERETT, WASH.**—This place has probably defeated the proposition of issuing bonds to the amount of \$2,000,000 for the establishment of a municipal power plant.

**JUNEAU, ALASKA.**—The Alaskan Endicott Mining & Milling Company, C. W. Mason, president, has a crew of men ready to develop water power to operate a sawmill before installing a stamp mill at William Henry Bay on Lynn Canal.

**ROSEBURG, ORE.**—The \$500,000 bond issue for a municipal light and power plant carried by a vote of 974 to 246. The plant is to be located at Whistlers Bend, 12 miles from the city. A bond issue of \$7,500 for an aviation camp also carried.

**SEATTLE, WASH.**—A contract was awarded by the Board of Public Works to the Pacific Lamp & Supply Company, Prefontaine Building, for furnishing the city with approximately 400,000 lamps with 37 and 27 per cent discount on the basis of \$100,000 net purchase.

**NEWPORT, WASH.**—Calispell Light & Power Company, owning a power line from Dalkena to Cusick, has applied to State Hydraulic Engineer Marvin Chase for a permit to use 20 cubic feet per second of water from the North Fork of Calispell Creek for power purposes and site for power plant. An ultimate development of 600 hp. can be had at the site.

**SPOKANE, WASH.**—Improvements to be made to the Inland interurban and city traction lines this year will cost \$260,000, according to General Manager F. E. Conners. It is the intention of the company to build up its Colfax, Washington and Moscow interurban lines. The sum of \$160,000 will go into interurban lines and \$100,000 into traction city lines.

**SALEM, ORE.**—The Oregon public service commission, in an order issued recently, granted in part the application of the Eastern Oregon Power Company for the establishment of a new rate schedule for electric current, with cancellation of all contracts not now conforming to these charges, and reduced the prompt payment discount on lighting bills from 10 to 5 per cent.

**FOREST GROVE, ORE.**—The city council is considering what to do with the power and light system here. More facilities must be provided. Additional equipment must be secured, and the question is how to buy this machinery at a reasonable figure. A committee has been instructed to investigate a proposition of the Wilamette Equipment Co. of Portland, which has equipment at Seattle ready for shipment.

**SEATTLE, WASH.**—Sealed bids will be received up to June 21 at 10 p.m. for building a reinforced concrete bridge over the Sunnyslope draw, estimated quantities, 696 cu. yds. concrete; 19,000 pounds steel; 550 cu. yds. fill. Also reinforced concrete arch bridge over Elliott river, estimated quantities, 610 cu. yds. con-

crete; 17,000 pounds steel; 900 cu. yds. fill. Plans and specifications can be obtained at the office of the county engineer for a deposit of \$5.00.

**SEATTLE, WASH.**—George F. Nicholson, city engineer of the Port of Seattle, reports that he, with assistant chief engineer G. W. Whitestone has secured a patent for a portable electric stacking elevator which will greatly decrease the cost of handling cargo, and reports further that a new ship conveyor of exceptional merit is being designed by the engineers and draftsmen of his department. The port commission will then take over the patent and will have it protected.

**EUGENE, ORE.**—Higher water and electric light rates for Eugene, beginning June 1, have been announced by the Eugene water board. It is no longer possible to postpone a slight revision, says the board, if an adequate depreciation reserve fund is to be provided. Under the new rate the minimum charge will be advanced approximately 20 per cent for all classes in both departments. No other change in rate is contemplated for electric service, but for water, above the minimum charge, the primary rate will be 12 cents per 100 cubic feet a month instead of 10 cents.

**SEATTLE, WASH.**—The party touring the coast on its way home from the N. E. L. A. convention arrived in Seattle on the morning of June first. After breakfast at the New Washington Hotel, the visitors were taken to the generating plants at Snoqualmie Falls and White River. Luncheon was served at Snoqualmie and at White River and at the Country Club a round of golf was offered the travelers. After a banquet in the evening the visitors were the guests of local men at the Moore Theater. From Seattle they went to Victoria by boat and on to Vancouver where they boarded their special east bound train.

**SEATTLE, WASH.**—Hearing of the suits brought by the city of Seattle and the Puget Sound Traction, Light & Power Company to enjoin King county from collecting \$401,017 taxes assessed in 1919 on the municipal street car lines, in the Superior Court, was begun on June the fourth. The city and the traction company are contending that the street railway property was public property at the time of assessment and therefore not subject to taxation, while the county holds that at the time of assessment, March 15, 1919, the city had not come into title of the lines and therefore the assessment was valid. At the time the city purchased the street car lines from the Puget Sound Traction, Light & Power Company it was agreed between them that in event the taxation was found valid, each should pay a proportion of the tax based on the time the property was in their possession. This would mean that the traction company would pay one-fourth of the tax and the city three-fourths, or approximately \$300,000, as it held title to the lines for the last nine months of the year.

### THE PACIFIC CENTRAL DISTRICT

**ALAMEDA, CAL.**—The Eel River was recommended as the most favorable water project by the East Bay Water Commission in its final report to the city council.

**LINDSAY, CAL.**—Within a few days, work will start on a water reservoir to hold 250,000 gallons.

**OXNARD, CAL.**—The Ross Construction Company has been awarded the contract for the drainage work of the Oxnard irrigation district.

**RED BLUFF, CAL.**—A bond election will be held to vote on a water plant and system for this city which is allowed to bond for \$160,072.

**MERCED, CAL.**—The report of the Bear Creek commission contains provisions for raising and spending \$9,000 for flood control in a district surrounding Merced, six by eight miles in area.

**NEVADA CITY, CAL.**—It is reported here that Lake Spaulding, the big storage reservoir of the Pacific Gas and Electric Company, is rapidly filling with water from melting snow. It is stated that the water is now at a stage 17 feet higher than last year with every indication that the reservoir will be well filled.

**ALAMEDA, CAL.**—The contract for the erection of a sub-station on Webster Street and Atlantic Street was awarded to Palmer and Petersen Contracting Company of San Francisco by the Municipal Electric Light Department. The company's bid was \$29,900. The building will be of reinforced concrete and the work will be started at once.

**SAN FRANCISCO, CAL.**—Samuel Kahn, manager of the Western States Gas & Electric Company, reports that the gross earnings of the company have passed the two-million-dollar mark, as the earnings for the 12 months ended April 30, 1920, amount to \$2,027,246, which represents an increase of \$316,775, or 18.5 per cent over the 12 months ended April 30, 1919.

**MADERA, CAL.**—The directors of the Madera irrigation district have determined to proceed at once with the preliminary work of the district. This decision marks a change in the policy of the board, which had previously announced its determination to delay action until the supreme court should have rendered its decision in the case now before it which relates to the Madera irrigation district.

**ROSEVILLE, CAL.**—The Placer county farm adviser's office reports that Stephen Kieffer, consulting engineer, has reported on the feasibility of several reservoir sites tributary to the American River. These are designed to increase the water supply for the irrigation district that is being organized in the Aller and Roseville farm centers. Kieffer's plan would, it is estimated, harness sufficient water to supply 15,000 acres.

**AUBURN, CAL.**—County Surveyor Jerome Barieau, accompanied by W. F. McClure, state engineer; Frank Adams of the division of irrigation investigation of the Department of Agriculture, California district; M. Langstaff, supervisor, and Farm Adviser Amundsen are preparing to make an extensive investigation of the French Meadows country to determine the feasibility of a suitable reservoir site to supply water for the Forest Hill Divide.

**SUSANVILLE, CAL.**—Announcement is made here that the Red River Lumber Company is negotiating for the properties here of the Lassen Electric Company and will probably assume ownership as soon as certain legal adjustments are made. The Red River company is now engaged in installing its own power house on the Feather.



River and will be in position to supply nearby points with electrical energy. The plans include the construction of a power line between Westwood and Susanville.

**RICHMOND, CAL.**—Deeds were filed at the county seat transferring to the Southern Pacific Company a right of way for an electric line from the Alameda county line through Richmond Annex into Richmond. The deeds are from E. J. Henderson, Oakland realty dealer. While no immediate building enterprise is expected from the railway company, the filing of the deeds is taken as an indication that the company ultimately expects to extend the Ninth Street loop into Richmond.

**PLACERVILLE, CAL.**—The board of trustees has framed an ordinance, adopted at a meeting on June 7, which calls for an election on June 29, when the citizens will be asked to vote on a \$30,000 bond issue for the purchase of the distributing plant of the Placerville water works and improvements thereto. The bonds will carry 5½ per cent interest. The trustees plan to spend \$10,000 on improvements to the plant and extensions of the water mains. The remainder will be absorbed in the purchase.

**SAN FRANCISCO, CAL.**—Application for approval by the State Railroad Commission of the purchase of the California Power and Manufacturers Company's holdings on Fall River has been made by the Mount Shasta Power Company, an extension of the Pacific Gas & Electric Company. The price stipulated is \$110,902.64. The purchase of the Fall River rights is a step in line with the program of greatly increasing water power facilities and equipment in Northern California, officials of the Pacific Gas & Electric Company announced.

**YUBA CITY, CAL.**—Following closely an announcement to the rice growers of Sutter county by the Sutter-Butte Canal Company that irrigation ditches would cost \$7 an acre, came the announcement from the company that the ditches now would cost \$20 an acre, an increase of more than \$200,000 in cost to the rice men. The Western Canal Company and the Sutter Water Users' Association joined with the canal company in the announcement. To discuss ways and means of raising the additional \$200,000 the rice men have called a conference in Yuba City.

**SAN FRANCISCO, CAL.**—The Electrical Home in St. Francis Wood, 25 Junipero Serra Boulevard, was opened on Friday, June 11, at an invitational ceremony participated in by city officials, the California Electrical Cooperative Campaign Committee, San Francisco Electrical Development League and Mason-McDuffie Company, agents for St. Francis Wood. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, presided over the ceremony and Acting Mayor Ralph McLeran was the principal speaker. Following the brief ceremony, visitors were given a demonstration of electricity in the home, such as has never before been witnessed in San Francisco.

**VISALIA, CAL.**—The San Joaquin Light & Power Corporation has been ordered to pay Tulare county \$168,686.81, representing 2 per cent of the concern's gross receipts for the three years ending November 10, 1913, in a decision handed down by Superior Judge Wallace. The decision ends litigation which had been pending for six years. The suit originated under a provision of the statutes that a county should receive 2 per cent of the gross annual receipts of a corporation to which it had granted a franchise for the erection of poles and wires along the public highways. Similar actions to collect 2 per cent of the annual revenues of the San Joaquin corporation for the years subsequent to 1913 are pending in Judge Wallace's court.

### THE PACIFIC SOUTHWEST

**EL CENTRO, CAL.**—The board of directors of the Imperial Irrigation District has rejected

all bids received for \$500,000 irrigation bonds, and will readvertise.

**SAN DIEGO, CAL.**—Work on the Barret Dam will not be interrupted as the Spreckels Bros. Commercial Company has agreed to accept bonds in payment for the 25,000 barrels of cement for dam construction.

**SAN BERNARDINO, CAL.**—Sealed bids were received June 1st by the Board of Water Commissioners for the construction of a pumping basin and pit, in accordance with plans and specifications on file in the office of the board.

**PASADENA, CAL.**—Plans are under way for the construction of a union depot by the Chamber of Commerce and railroads passing through Pasadena. The idea is to have the Salt Lake, Santa Fe and Southern Pacific, and also the Pacific Electric Railroad occupy one building. The location has not yet been decided.

**MIAMI, ARIZ.**—Extensive improvements are being made upon the water system here. Over \$15,000 of large pipe has been purchased and delivered. A new large reservoir in addition to the present one will be constructed. Improvements are being made under the supervision of T. J. Corcoran of the water system.

**PHOENIX, ARIZ.**—Claiming an increase in the cost of operation, the Southside Gas and Electric Company has filed its application with the corporation commission for permission to increase its electric rates. The increase asked by the company is 20 cents for residence rates. T. M. Quebedeaux also asked for authority of the commission to sell the Winslow electric plant to the Arizona Electric Power Company.

**TUCSON, ARIZ.**—The electric district, organized for the distribution of power throughout the new pumping irrigation area lying between Yuma and Dome is rapidly becoming an accomplished fact. Pole lines are up, and the heavy copper transmission wires are being strung. Many wells and a few pumping plants are in readiness. More wells are being drilled and many pumps and motors have been contracted for. This is the first district organization under the electric district law passed by the legislature.

**LOS ANGELES, CAL.**—The moving picture entitled "That Fairy in the Snowflake," which had its debut at the Pasadena convention, has already achieved an enviable reputation as a film which combines a pretty story with a message. Since its appearance at the convention the picture has had several showings at regular theaters and was also a feature at the Pacific Coast Advertising Clubs convention recently held in Stockton. Many requests for its appearance in the East have been received and it is quite likely that the "Fairy" will soon go on the road for a long and successful career.

**EL MONTE, CAL.**—The S and H Electric Company, Inc., is the name of a new organization which has just opened an electric shop at El Monte, in the suburbs of Los Angeles. The new concern is also arranging to care for similar business in the neighboring towns of Rivera, Montebello, Pico, Rosemeade and San Gabriel, operating from their present store. R. E. Heerman, for several years manager of the stationery department of the Southern California Edison Company, will be in charge of the new venture. The new company will conduct a general contracting and commercial business.

### THE INTER-MOUNTAIN DISTRICT

**REXBURG, IDAHO.**—The city of Rexburg has recently replaced the fifty horsepower motor operating the municipal pump, with a 100 hp. motor.

**HUGO, COLO.**—Ordinance No. 48 which has recently been passed in this city relates to the installation and inspection of electric wiring and apparatus within the town limits, and creates an electrical inspection department which provides for the licensing of companies, firms, copartnerships, corporations and individuals engaged in the business of electric wiring.

**LAUREL, MONT.**—Contract has been awarded to Montana Power Company of this city for a lighting system in Special Improvement District No. 2, on a bid of \$11,617.

**BOISE, IDAHO.**—A modern electric pumping plant, to irrigate about 1200 acres of fertile Snake River Valley land, is now being installed. This is known as the Zion irrigation project, and is situated about 40 miles south of Boise, Idaho.

**ANCO, IDAHO.**—The Burley Electric Company completed the construction of its line to this city on June 1. The manager has stated that it will be ten or fifteen days before 24-hour service is available, as considerable work is necessary on the present system before it is in shape to take care of the additional service.

**EUREKA, UTAH.**—Electricians are now busy installing electrical equipment at the site of the Tintic Standard Mining Company's new mill near Warm Creek. They will put in a transformer plant and a large amount of electrical machinery before finishing their contract. In connection with the mill there will be an electrically operated tramway and two pumps. The entire mill will be electrically operated.

**MILFORD, UTAH.**—The Telluride Power Company has completed the power line in the irrigation district near Milford, the line running a little more than six miles in a south-westerly direction. The company intends to extend the line as business grows in the territory. The line is three-phase construction, 66,000 volts. There has been installed a separate substation to take care of the irrigation pumping load, the capacity of which is 400 hp.

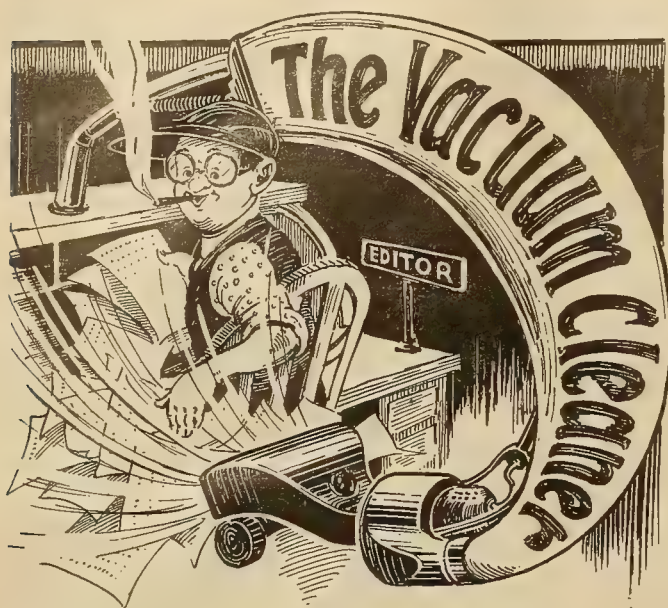
**RED LODGE, MONT.**—Work on the new central power house of the Northwestern Improvement Company on the east side is well advanced. Installation of equipment has already begun and the company will shortly move the electrical apparatus from the old No. 2 stone building to the new house. Eventually the power plant of the west side will be transferred to the new site, so that power for the east side and west side mines, as well as for the new No. 3 mine now being opened up, will be furnished from the one plant.

**ROBERTS, IDAHO.**—The Phoenix Utility Company is working with a large force of men on the power line which is to be extended six and a half miles from the Tughartburg ranch to the Kennedy & Burggraf ranch, where it is to be used to pump water on 2,000 acres of land. After this is completed work will commence on a line around the slough east of town, where two large pumps will be installed on the south bank and the water pumped into a canal which will extend from Roberts to Bassett, to be used for irrigation purposes.

**AULT, COLO.**—A company of Fort Lupton town officials were in Ault recently looking over the municipal light and power plant and inquiring as to the degree of satisfaction that it is giving and of its success so far as it has been demonstrated. Lupton receives its service from the Western Light & Power Company, the original source of the current that has been distributed to Ault consumers for years by the Farmers Electric & Power Company of Eaton, and has had some disagreement recently relative to some of the conditions on which the service is to be extended.

**STERLING, COLO.**—Considerable interest is being shown by farmers of Logan county in the lighting and power plant of the American Electric Light and Power Company, which recently established a factory in Denver, and the machines are now being manufactured and sold. The machine automatically starts when a light is turned on at any part of the farm. It recharges its own batteries and in case of any sort of trouble with the engine gives warning in dim lights and subsequently stops the engine. The owner needs only furnish gas and oil for the gas engine.





A friendly feeling is a business asset when developed to its fullest extent and judiciously applied. A certain coal merchant, a canny Scot, decided that like the quality of mercy it "blesses him that gives and him that takes."

"How is it, Sandy," asked a visitor, "that you quote the lowest prices in town and make reductions to your friends, and yet you can make money?"

"Well, it's this way," explained Sandy in an undertone. "Ye see, I knock off two shillings a ton because a customer is a freen o' mine and then I knock off two hundred weight a ton because I'm a freen o' his."

The gospel of thrift is gradually being drilled into the American public. We have recently heard of a young San Francisco couple who determined to save their electric light bill, and fed the baby garlic so they could find it in the dark.

The saturation point in electrical development is not yet, nor have inventors finished improving the earth. A London engineer says that there will come a time when aeroplanes and the X-ray will be primitive and that 500 years hence our descendants will look back upon conditions in 1920 with just such feelings of amused pity as we show for the state of the savages of prehistoric times.

The scientist predicts among other things that in 2420 A. D. all public thoroughfares and parks will be underground, vehicles will be run by wireless, telephones will carry an attachment enabling the speakers to see each other, and all roads will be as smooth as billiard balls.

"When a man sets out for business," he says, "he will not proceed, as he does now, by tramway car or train; he will pass along delightful avenues underneath the surface of the earth. Parks and all other places of public resort and beauty will be roofed in.

"Motor cars and all motor vehicles will proceed by wireless power and not by the crude method of using petrol. They will be fitted up like luxuriously appointed drawing-rooms and will be driven at a rate of 100 miles an hour. Wireless telephones will be installed in the cars, as well as every kind of appointment making for luxury and comfort. Many people will own these cars."

One's point of view alters one's definition of a word, at least it did when Detroit recently ordered six first aid kits from Chicago the other day and Chicago filled the order with six Pyrene fire extinguishers.

Progress is measured by a backward look, wherefore one of our esteemed contemporaries devotes a small space every day to recalling events of a quarter-century ago. We suggest the following:

#### Twenty-five Years Ago Today —

You could afford to buy two shoes at a time.

Newspapers didn't always call legislators "solons."

A map of Europe was good for several years.

People had tonsils.

Potatoes were not sold by the cubic inch.

Nobody began sentences with "Before the war" or "During the epidemic."

The streets were safe for pedestrians.

"Dardanella" hadn't been composed.

\* \* \*

True gratitude may be shown in numberless ways. A certain tramp who had been warmed and fed by a kindhearted minister said, on leaving:

"Parson, I can't give you any money, but I know how to fix your gas-meter so it won't register."

\* \* \*

A sound moral is to be deduced from the instance of a certain canvasser who was endeavoring to convince an old butcher of the advantages of electric lighting. "Well!" said the butcher, "I don't know anything about these 'ere units that you keep talking about, but 4d. sounds a lot for one of 'em!"

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#### COMFORT ANYWHERE

An outlet for every appliance and an appliance for every climate. There is a place for electricity in your home. Make it serve you.















